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PROSPECTUS

OF THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and of the Regulations for Diplomas.

Eleventh Session, 1888-9.

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TORONTO:
PRINTED BY WARWICK & SONS, 26 AND 28 FRONT STREET WEST.
1888.

Faculty of the School.

D. WILSON, LL.D., F.R.S.E., CHAIRMAN OF THE BOARD.

MEMBERS OF THE BOARD:

E. J. CHAPMAN, Ph. D., LL.D.....*Professor of Mineralogy and Geology.*
JAMES LOUDON, M.A.....*Professor of Physics.*
R. RAMSAY WRIGHT, M.A., B.Sc.....*Professor of Biology.*
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W. H. PIKE, M.A., Ph.D.....*Professor of Chemistry.*
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W. H. ELLIS, M.A., M.B.....*Professor of Applied Chemistry.*
A. BAKER, M.A.....*Professor of Mathematics.*

ASSISTANT INSTRUCTORS, 1887-8.

W. J. LOUDON, B.A.....*Demonstrator in Physics.*
F. W. BABINGTON.....*Demonstrator in Applied Chemistry.*
A. B. McCALLUM, B.A.....*Lecturer in Physiology.*
J. H. McGEARY, B.A.....*Fellow in Mathematics.*
A. C. McKAY, B.A.....*Fellow in Physics.*
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G. CHAMBERS, B.A.....*Fellow in Chemistry.*
F. G. WAIT, B.A.....*Fellow in Mineralogy and Geology.*
D. BURNS.....*Fellow in Engineering.*

SECRETARY OF THE BOARD:

H. H. LANGTON, B.A.,

To whom application may be made for information further than that contained in the present Prospectus.

Engineering Department.

SESSION 1887-8.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

1st Year.

Boulton, W. R.
Bowman, F. M.
Bucke, M. A.
Corrigan, G. D.
Duff, J. A. (B.A.)
Eaman, John.
English, A. B.
Garland, N. L.
Hutcheon, J.
Innes, W. L.
Johnson, R. T. (B.A.)
McCollum, T. E. B.
Meade, H.
Merrill, E. B.
Moodie, J. W. D.
Moore, A. H.
Pedder, J. R.
Peterson, C. E.
Ross, R. A.
Ross, D. W.
Russell, T. S.
Senkler, W. I.
Symmes, H. D.
Wells, J. R.
Wiggins, T. H.

2nd Year.

Carey, Brock.
Chalmers, W. J.
Clement, W. A.
Hanning, G. F.
Haultain, H. E. T.
Irvine, J.
James, D. D.
Mill, F. X.
Moberly, H. K.
Moss, F. H.
Rosebrugh, T. R. (B.A.)
Shillinglaw, W. H.
Wickett, T.

3rd Year.

Apsey, J. F. (P. L. S.)
Ashbridge, W. T.
Ball, E. F.
Brown, D. B.
Canniff, C. M.
Colquhoun, W. E.
Chewett, H. J.
Gibbons, J.
McDowall, R.
McFarlen, G. W.
Marani, C. J.
Mickle, G. R. (B.A.)
Moore, J. H.
Richardson, G. H.
Rose, K.
Ross, J. E.
Withrow, W. J.
Wright, C. H. C.

SPECIAL STUDENTS.

1st Year.

Mechanical Engineering.

Bennetts, W.
Price, A.
Cronyn, C.

2nd Year.

Mechanical Engineering.

WILKIE, G.

Surveying.

FAWCETT, ADAM. NEWMAN, WM. TUCKER, C. R.
LATIMER, R. S. RORKE, L. V.

GRADUATES.

NOTE.—Graduates are requested to inform the Professor of Engineering as to changes in their addresses.

1881.—J. L. Morris. C.E., P.L.S., Pembroke.

1882.—J. McAree, P.L.S., D.T.S., Toronto.
D. Jeffery, Contractor, Winnipeg.
J. H. Kennedy, C.E., Architect, etc., St. Thomas, Ont.

1883.—G. H. Duggan, Dominion Bridge Co., Montreal.
J. W. Tyrrell, P. and D.L.S., Canadian Pacific Railway, Maine.
D. Burns, Fellow in Engineering, School of Practical Science, Toronto.

1884.—E. W. Stern, Kansas City, Mo.
A. R. Raymer, Assistant Engineer, Canadian Pacific Railway, Greenville, Maine.
J. Robertson, P.L.S., Coad & Robertson, Civil Engineers, P.L. Surveyors, etc., Glencoe, Ont.
W. C. Kirkland, Canadian Pacific Railway.
J. McDougall, B.A., Welland Canal.

1885.—B. A. Ludgate, P.L.S., Peterboro', Ont.
O. McKay, P. L. S., Windsor.
E. E. Henderson, Canadian Pacific Railway, Brownville, Maine.
F. W. Bleakley, care of A. W. Keadie, Quincy, California.
H. J. Bowman, P. and D.L.S., Berlin, Ont.

1886.—T. K. Thompson, Dominion Bridge Co., Montreal.
H. G. Tyrrell, Assistant Engineer, C. P. R. Maine.
R. Laird, P.L.S., Toronto.
A. M. Bowman, P. and D.L.S., Berlin, Ont.
E. B. Hermon, P. and D.L.S., Vancouver, British Columbia.

1887.—A. E. Lott, Atcheson, Topeka and Santa Fee Railway, Topeka, Kansas.
J. Roger, Woodstock.
J. C. Burns, Architect's Office, Toronto.
C. H. Pinhey, Surveyor's Office, Willowdale.
A. L. McCulloch, Galt.
F. A. Martin, Surveyor's Office, Orangeville.

FELLOWSHIP IN ENGINEERING.

A Fellowship of the value of $500 per annum, paid in eight monthly instalments, has been established, open only to Graduates in Engineering of the School.

The Fellow is required to take such portions of the work of instruction as may be assigned to him by the Professor of Engineering.

Candidates for the Fellowship are required to make written application to the Secretary on or before 20th September.

PRIZEMEN.

1879.—	I. Year	J. McAree	1st prize.
1880.—	II. Year	J. L. Morris	1st prize.
1881.—	I. Year	G. H. Duggan	1st prize.
	II. Year	D. Jeffrey	1st prize.
1882.—	I. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	II. Year	G. H. Duggan	1st prize.
	III. Year	D. Jeffery	1st prize.
1883.—	I. Year	B. A. Ludgate	1st prize.
	" "	A. M. Bowman	2nd prize.
	II. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	III. Year	G. H. Duggan	1st prize.
1884.—	II. Year	B. A. Ludgate	1st prize.
	III. Year	E. W. Stern	1st prize.
	" "	A. R. Raymer	2nd prize.
1885.—	I. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
	II. Year	T. K. Thompson	1st prize.
	III. Year	B. A. Ludgate	1st prize.
1886.—	I. Year	C. H. C. Wright	1st prize.
	" "	J. E. Ross	2nd prize.
	II. Year	A. E. Lott	1st prize.
1887.—	I. Year	H. E. T. Haultain	1st prize.
	II. Year	C. H. C. Wright	1st prize.
	III. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.

UNIVERSITY OF TORONTO.

DEGREE OF C. E.

Date of Admission.	
1885	J. L. Morris.
1886	J. H. Kennedy.

Department of Analytical and Applied Chemistry.

Regular Students.

1st Year.

Boustead, W. James, O. S.

3rd Year.

Johnston, R. A. A.

Special Student.

Tobey, C. W.

School of Practical Science,

PROVINCE OF ONTARIO.

PROSPECTUS FOR THE SESSION 1888-9.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education, confirmed by the Lieutenant-Governor in Council, on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College, whereby the students of the School of Practical Science enjoy full advantage of the instruction given by its Professors and Lecturers in all departments of Science embraced in the work of the School. In addition to this, the Faculty of the School of Science includes Professors of Engineering and Applied Chemistry, and assistants in the several departments.

The position which it is intended that the School of Practical Science shall occupy in the eductional system of Ontario may be indicated as follows :—

I.—Students, who have passed through the regular courses of the School, will be enabled to prosecute professionally : (1) Engineering ; (2) Assaying and Mining Geology ; or (3) Analytical and Applied Chemistry. With this view, Diplomas will be granted in each of those branches after due examination.

The instruction in Engineering is designed to give the student a thorough knowledge of the scientific principles of the Profession, and also to afford such practical training in drawing and surveying as will make him immediately useful in the office and field.

The establishment of a Diploma for special qualifications in Assaying and Mining Geology, apart from the knowledge of these subjects incidental to the course of Mining Engineering, is called for by the necessity which exists for the development of the mineral wealth of the Province. Students who pass through the course necessary to obtain this Diploma will have acquired the knowledge requisite for inspecting and surveying mineral lands, as well as the ability to report accurately on the composition and value of economic minerals generally.

The importance of the study of Chemistry is now fully recognized, and in Canada, through the Public Analysts and otherwise, protection is being secured to consumers, while the producers are necessarily brought to recognize its importance. The course in Chemistry is such as to fit the student for the position of Public Analyst or of Consulting or Resident Chemist.

II.—It is designed to furnish preliminary scientific training for students entering the professions of Surveying and Medicine.

Certificates in Surveying will be granted after due examination, which will have the effect of shortening the ordinary period of apprenticeship to a Land Surveyor, by the length of time covered by such certificates—one, two or three Sessions, as the case may be.

The School of Practical Science offers to Medical Students thoroughly practical courses of instruction in those sciences which form the best preliminary training for the study of Medicine. The Lecturers and Laboratory Courses are arranged so as to conform with the Regulations of the University of Toronto.

III.—Persons desirous of instruction in any of the subjects taught in the School, may be allowed to attend separate courses in these, as *Special Students.*

MECHANICAL ENGINEERING.

Students intending to become Mechanical Engineers will enter as special students, and receive instruction in the principles of mechan-

ism, the theory of machines and drawing, together with such work in the civil engineering course as may be suitable for their purpose.

ELECTRICAL ENGINEERING.

Students intending to become Electrical Engineers are admitted as special students, and will receive instruction in drawing, mechanical engineering and electricity. The physical laboratory is furnished with a good collection of electrical instruments; and a separate room will be set apart for experimental work in this department. Special attention will be given to the subject of Electrical Testing. In connection with the Physical Laboratory there is a Workshop, the power being given by a 4 H.-P. gas engine.

ARCHITECTURE.

Students who intend to pursue Architecture as a profession, are advised to take, if possible, the regular course in civil engineering, as the instruction given in this course in the subjects of Drawing, Colouring, Principles of Construction (Carpentry, Masonry and Ironwork), Strength and other Properties of Building Materials, Flow of Water and Air, Theory of Heat, etc., will be as useful to them as to civil engineers. They may enter as special students if they please.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour the Lieutenant-Governor in Council the 4th day of February, 1887.

1. The internal management and discipline of the School shall be vested in the Board consisting of the Professors and the Chairman, as nominated by the Lieutenant-Governor in Council.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December; and the Second Term from 8th January to 18th April.

3. There shall be three Departments in which Diplomas shall be granted, viz:—
   (1) Civil Engineering (including Mining Engineering).
   (2) Assaying and Mining Geology.
   (3) Analytical and Applied Chemistry.

A Diploma shall be granted to each student who shall have completed to to the satisfaction of the Faculty, the Regular Course in any of the above Departments.

4. The Regular Course for the Diploma of the School in each Department is three years in duration.

5. A student who proposes to obtain the Diploma of the School in one of the above Departments must have passed the Matriculation Examination required for admission to a University in any part of Her Majesty's Dominions, or the Entrance Examination of the Law Society of Upper Canada, or of the College of Physicians and Surgeons, or any of the Examinations prescribed for Teachers in Public or High Schools of the Province of Ontario, or must present a certificate signed by a Head Master of a High School or Collegiate Institute that he possesses qualifications equivalent to those required for such teachers.

6. Special Students may be permitted to attend such lectures or courses of instruction or of practical work, as the Board may think proper.

7. Certificates of attendance and standing may be given upon due examination to Special Students, and such students shall not be required to pass an Entrance Examination.

(6 and 7 apply to Medical Students taking special work, also students preparing themselves to be Surveyors, Mechanical or Electrical Engineers, Architects, etc.)

8. At the conclusion of each term, examinations will be held in the different subjects taught, and prizes will be awarded for excellence in each Department at the end of the session. Candidates for Diplomas and Certificates are required to enter for these.

9. All Regular Students are required to be in attendance at the School during the whole or each term, unless exempted by special permission of the Board. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Board for bad conduct, and adjudged guilty thereof.

10. Students of the School of Practical Science shall attend such courses of lectures as are delivered by the Professors of the University College to the students thereof, so far as applicable to both classes of students, while instruction of a practical character in the Department of Engineering is especially appointed for students of the School.

REGULAR COURSES FOR THE DIPLOMA.

See regulations 2, 3, 4, 5, 8, 9, 10: pp. 12 and 13.

The fees (payable through the Secretary to the Provincial Treasurer), for instruction in any of the Departments, are as follows:

First Session: Thirty Dollars.

Second Session: Forty Dollars.

Third Session. Fifty Dollars.

These are payable in two instalments, one at the beginning of each term. There is no extra fee for Diploma.

The following are the Departments in which the Diploma is granted

(1) Civil Engineering (including Mining Engineering).

(2) Assaying and Mining Geology.

(3) Analytical and Applied Chemistry.

FORM OF DIPLOMA.

THE

School of Practical Science,

PROVINCE OF ONTARIO.

(ESTABLISHED 1878.)

THIS IS TO CERTIFY *that*

....
of the.....*in the*.....
.....*has completed the Regular Course*
of this School for the Diploma in the.....
extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz.:
....
....
....

WHEREFORE *the said*..... .....
becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*..... .....
.....*One thousand eight hundred and*.....
and have caused the Seal of this School to be hereunto affixed.

.....*Chairman.*

[L. S.]

.....*Secretary.*

DEPARTMENT OF

TIME TABLE OF

Instruction will be given during the Session

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Practical Chemistry.	Drawing.
10-11		
11-12	*Geometry & Trigonometry	Chemistry.
12-1	Statics.	Descriptive Geometry.
1-2		
2-3	Drawing.	Surveying (lecture).
3-4		Field Work.
4-5		

SECOND YEAR.

9-10	Strength of Materials.	*Astronomy.
10-11	*Physics (Hydrostatics and Optics).	*Calculus.
11-12	Drawing.	Practical Chemistry.
12-1		
1-2		
2-3	Drawing.	Applied Chemistry.
3-4		Field Work.
4-5	El. Mineralogy & Geology.	

THIRD YEAR.

9-10	Drawing.	Drawing.
10-11		
11-12	Theory of Internal Stress.	Constructive Design.
12-1	Drawing.	Mineralogy.
1-2		
2-3		Thermo-dynamics.
3-4	Hydraulics (*b*).	Field Work.
4-5	Constructive Design.	

* Lectures in University College.

Additional lectures are given at hours not specified in above time-table and when the weather will not permit of field work.

CIVIL ENGINEERING.

REGULAR COURSE.

1888-9, according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Drawing.	Drawing.	Drawing.
Chemistry.	*Conics.	*Algebra & Trigonometry.
Statics.	Drawing.	Dynamics. (*b*)
		Drawing.
Practical Chemistry.	Field Work.	Field Work.

SECOND YEAR.

Strength of Materials.	*Astronomy.	*Calculus.
*Physics (Hydrostatics and Optics).	Descriptive Geometry.	*Physics (Hydrostatics and Optics).
Drawing.	*Physics (Hydrostatics and Optics.) Spherical Trigonometry.	Practical Chemistry.
Drawing.	Applied Chemistry.	*Experimental Physics.
	Theory of Surveying Inst.	Field Work.
El. Mineralogy & Geology.	Practical Mineralogy. (*b*)	

THIRD YEAR.

Applied Chemistry.	Rigid Dynamics.	Applied Chemistry.
Geodesy and Astronomy.	Drawing.	Geodesy and Astronomy.
Descriptive Geometry.		Constructive Design. (*a*)
Drawing.		Hydraulics. (*b*)
	Thermo-dynamics.	
Drawing.	Practical Mineralogy. (*a*)	*Experimental Physics.
	Field Work. (*b*)	

(*a*) During First Term. (*b*) During Second Term.

This time table is subject to modification, when necessary, to prevent conflict of hours.

I. DEPARTMENT OF ENGINEERING

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Mining Engineers).

Students who wish to devote themselves to the practice of Mining Engineering are allowed to take the work specially mentioned under this head, in the Third Year, and to omit the work in Experimental Physics.

They are advised, however, to take, if possible, the regular course in Civil Engineering and the special work subsequently as Special Students.

Subjects of the First Year.

Pure Mathematics.

Euclid, Algebra, Plane Trigonometry, Analytical Geometry of two dimensions.

Applied Mathematics.

Statics and Dynamics (with special reference to Structures and Machines).

Drawing.

Copying from the Flat. Lettering.
Model Drawing.
Map and Topographical Drawing.
Orthographic (including Isometric), and Oblique Projections.
Graphics.

Surveying.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary Instruction in use of the Transit and Theodolite—Plotting, Mensuration.

Chemistry.

General Chemistry.
Practical do.

Subjects of the Second Year.

Pure Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Applied Mathematics.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

Experimental Physics.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Telescope and Microscope, and Reflecting instruments.

Drawing.

Subjects of First Year continued.
Coloring and Shading.
Descriptive Geometry, including Projections of the Sphere and Theory of Mapping.
Machines and Structures.

Engineering and Surveying.

Theodolite Surveying (including laying out Railway Curves).
Principles of Geodesy (considering the Earth a Sphere).
Applied Mechanics.
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.
Theory of the Theodolite, Transit-Theodolite and Level.

Chemistry.

Practical Chemistry.

Chemistry (Applied).

Combustion, Fuel, and Furnaces.
Artificial Lighting.
Explosives.
Laboratory Practice.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

SUBJECTS OF THE THIRD YEAR.

APPLIED MATHEMATICS.

Dynamics of Machines.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.

EXPERIMENTAL PHYSICS.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry. Principle of Least Squares.

DRAWING.

Subjects of previous years continued.
Shades and Shadows, Stone Cutting, Perspective.
Original Designs (Bridges, Roofs, Floors, etc.).

ENGINEERING AND SURVEYING.

Subjects of previous years continued.
Levelling. Setting out Excavation, Cross-sectioning, Calculation of Quantities.
Application of principles to practical problems connected with the design and construction of various Structures and Machines, *e. g.*, Foundations, Retaining Walls, Arches, Roofs, Bridges, Roads, Railways, Canals, Sewers, Water Wheels, Steam Engines, Hydraulic Machinery, Mining Machinery, etc.
Practical Astronomy.
Geodesy (Considering the Earth a Spheroid.)

CHEMISTRY (APPLIED).

Mortars and Cements.
Bricks and Artificial Stones.
Preservation of Wood, Iron and Stone.
Water, Air and Sewage.
Metallurgy of Iron and Steel.
*Metallurgy of Copper, Lead, Silver and Gold.

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* Mining Engineering only.

MINERALOGY AND GEOLOGY.

Economic Minerals of Ontario.
Blowpipe Analysis and Determinative Mineralogy.
*Assaying and Mining Geology, Mining Calculations.
*Crystallography and Palæontology.

NOTE.—Each Student is required to furnish himself with the following drawing instruments and materials, viz. :—

One drawing-board, 23″ × 31′; 1 T square, 31 inch ; 2 set squares, 60° and 45°, not less than 6″ on the side; 1 6″ (or larger) protractor ; 1 12″ triangular scale, containing 10, 20, 30, 40, 50, and 60 chain scales ; 1 12″ triangular scale, containing $\frac{1}{16}$, $\frac{1}{8}$; $\frac{1}{4}$, $\frac{1}{2}$; 1 2; $\frac{3}{8}$, $\frac{3}{4}$; $1\frac{1}{2}$, 3 ; $\frac{1}{5}$, $\frac{1}{10}$ open divided scales; 1 drawing pen ; 1 pair dividers ; 1 pair compasses with ink and pencil points, lengthening bar, etc. ; 1 set spring bows, crow-quill pens, French curves, 1 2ft. pocket rule, Arkansas oil stone, thumb-tacks, paper, tracing vellum, pencils, rubber, colors, sponge, brushes, nest of saucers, water mug, etc., and one portfolio for drawings.

The expenses for the Regular Course in the Department of Engineering are approximately as follows:—

Sessional Fees	$120 00
Books, instruments, drawing materials, laboratory fees, etc	120 00
Total	$240 00

These expenses are divided equally between the three sessions.

Each student in this department is required to contribute $1 per annum to a fund for the purpose of covering breakages and losses occurring to apparatus and furniture.

The payment of this fee will, however, not free any student from the liability to make good any loss or damage to instruments or furniture, arising from want of proper care on his part, when the above fund may prove insufficient for the purpose.

* Mining Engineering only.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and the Survey of Lands.

12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service; or, in case he has only received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required

by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service ; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The fee for special students in Surveying is $30 per session.

The attention of Candidates for the Diploma of D.T.S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

DEGREE OF C.E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884 :—

DEGREE OF C.E.

By the Senate of the University of Toronto.

Be it enacted :

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C.E. be hereby established, to be granted subject to the following conditions and regulations :

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.

5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.

6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates ; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.

7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate, not later than the first day of February.

8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.

9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the registrar not later than the first day of May.

10. The examination of the essay, drawings and estimates, and any further examination of the candidate that may be considered necessary, may be held in May.

11. The fee for the degree of C.E. shall be $20, and shall be paid to the Registrar not later than the first day of May.

12. The essay, drawings and estimates, submitted by the candidate, shall be the property of the University.

2. DEPARTMENT OF ASSAYING AND MINING GEOLOGY.

In this Department the student is fully prepared in all the methods of analysis necessary to render him a competent Assayer. He is also qualified to survey and report upon the value of mineral lands.

Subjects of First Year :

1. Elementary Mathematics, including Mensuration and Plane Trigonometry.
2. Elements of Natural Philosophy, including Mechanics and Hydraulics.
3. Inorganic Chemistry.
4. Elementary Mineralogy and Blowpipe Practice.
5. Elementary Biology.
6. Physical Geography, Palæontology and Geology.
7. Drawing.

Subjects of Second Year :

1. Higher Mathematics, including Spherical Trigonometry, etc.
2. Chemistry, with Laboratory practice in Qualitative Analysis.
3. Blowpipe Analysis and Determinative Mineralogy.
4. Geology and Economic Minerals of Canada.
5. Surveying and Levelling.

Subjects of Third Year :

1. Quantitative Chemical Analysis.
2. Metallurgy.
3. Assaying.
4. Study of Metallic Veins and other Mineral Deposits, Mining Calculations, Examinations of Mineral Lands.

3. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is under the charge of the Professor of Applied Chemistry.

The Course is intended to render the student proficient in all the methods of Analytical Chemistry, and to fit him for such positions as that of Public Analyst, Consulting Chemist in regard to Manufactures, or Resident Chemist in manufactories where such is required.

SUBJECTS OF FIRST YEAR :

1. Algebra, Euclid and Plane Trigonometry.
2. Natural Philosophy, with work in Laboratory.
3. Elementary Biology.
4. Inorganic Chemistry, Elementary and Advanced, with work in the Laboratory.

SUBJECTS OF SECOND YEAR :

1. Elementary Mineralogy and Geology.
2. Blowpipe Practice and Assaying.
3. Organic Chemistry with Applied Chemistry, Laboratory Work in Qualitative and Quantitative Analysis.

SUBJECTS OF THIRD YEAR :

Candidates are expected to be able to read Chemical Works in the French and German languages.

1. Applied Chemistry.
2. Inorganic Chemistry, including Thermo Chemistry and the study of Mendelejeff's Periodic Law. Advanced Organic Chemistry, Historical Development of Chemical Theory, and Physiological Chemistry.
3. Laboratory Works, including Technical Analysis, Quantitative Mineral Analysis, a prescribed course in Physiological Chemistry, and in Chemistry in its relations to Hygiene and Forensic Medicine.

Synopsis of the Courses of Lectures

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT,

WITH FEES FOR SPECIAL STUDENTS.

B. N.—Students who take the Practical Courses may attend the Lectures free of charge.

Special Students are advised to enter at the beginning of the Session (October 1st), as many subjects begun in the First Term are continued through the Second, and Lectures cannot be repeated.

I. ENGINEERING.

(Reductions will be made to Special Students taking several Courses.)

☞ Text-books for the First Year marked (*a*); for Second Year, (*b*); for Third Year, (*c*).

(I.) DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Principles of Mechanism, Theory of Mapping, etc.

Text Books and Books of Reference.—Davidson's Projections.
Angel's Plane and Solid Geometry.
Binns' Orthographic Projection.
Church's Descriptive Geometry (*a*), (*b*), (*c*).
Warren's Stone-Cutting (*c*).
McCord's Lessons in Mechanical Drawing.
Worthen's Topographical Drawing (*a*), (*b*), (*c*).

Fees for Special Students, $10.

(II.) SURVEYING AND LEVELLING.

LAND SURVEYING—

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING—

Longitudinal and Cross sections
Plotting.

SETTING OUT—

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION—

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*).
Henck's or Trautwine's Railway Curves (*b*).

Fees for Special Students, $10.

(III.) GEODESY AND PRACTICAL ASTRONOMY.

GEODESY—

Field Work.
Computation of the Triangles (considering the Earth, 1st as a Sphere; 2nd, a Spheroid).
Determination of the Figure of the Earth.

PRACTICAL ASTRONOMY—

Methods of determining Latitude, Local Time, Direction of the Meridian, and Difference of Longitude.

Theory of the Theodolite, Transit-Theodolite, Level, Sextant, and Solar Compass.

Text Books—Gillespie's Higher Surveying (*b*), (*c*).
Chauvenet's Spherical and Practical Astronomy (*c*).
Nautical Almanac for 1889 (*c*).
Chamber's Practical Mathematics (*c*).

Fee for Special Students, $15.

(IV.) APPLIED MECHANICS.

STATICS—

The Calculation of the Stresses in Framed Structures, Solid and Rivetted Beams, Stone Arches, etc. Both Graphical and Analytical Methods used.

THEORY OF THE STRENGTH OF MATERIALS—

DESIGNING OF STRUCTURES in Timber, Iron and Masonry—Arches, Retaining Walls, Foundations, Roofs, Bridges, etc.

DYNAMICS—

Representation and Measurement of Forces and Motions.
Principles of *Work* and *Energy*.
Efficiency of Machines. Friction.
Transmission of Energy—Belts, Shafts, Crank and Connecting Rod, etc.
Fly-Wheels, Governors.
Balancing of Machinery.
Etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN.

HYDRAULICS—

Discharge of Water through Orifices, Notches, etc. Flow in Pipes, and Open Channels. Water Power. Water Wheels, Turbines, Pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE.

Text Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
DuBois—Graphical Statics.
" Strains in Framed Structures.
Wood—Resistance of Materials.
" Bridges and Roofs.
Rankine—Applied Mechanics (*b*), (*c*).
Rankine—Steam Engine and other Prime Movers.
Unwin—Elements of Machine Design.
Shann—Elementary Treatise on Heat (*c*).
Kennedy—Mechanics of Machinery.
Jackson—Hydraulic Manual (*c*).
Neville—Hydraulic Tables and Formulæ (*c*).

Fee for Special Students, $15.

(V.) PRINCIPLES OF MECHANISM.

Principles of the Transmission of Motion without reference to Force :—
Pitch surfaces, Spur Wheels, Bevel Wheels, Skew-bevel Wheels, Trains of Wheelwork, Teeth of Wheels, Cams, Cranks, Eccentrics, Links, Bands and Pulleys, Hydraulic Connections, Frictional Gearing, Link Motion for Slide Valves, etc., etc.

Text Books and Book of Reference.—Rankine—Machinery and Millwork.
Camus—Teeth of Wheels.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism.

Fee for Special Students, $15.

The foregoing comprises the work to which the lectures and practical instruction will be principally confined. In addition, the Student will be required to obtain, by reading and observation during his course, a certain

amount of information regarding the processes and details of Engineering Works, as below:—

(VI.) ENGINEERING WORKS.

Roads and Bridges.
Canals and Harbours.
Water and Sewage Works.
Manufacture of Iron and Steel.
Manufacture of Mortars and Cements.
Workshop and Foundry Practice.
Mining Machinery and Processes.

Since information on these subjects is given in a plain and intelligible manner in the various treaties relating thereto, which can always be consulted by the Engineer when engaged in the actual practice of his profession, it has not been deemed expedient that much time should be given to them in the School.

(VII.) MATHEMATICS.

The Pure Mathematics included in this course will be taught in University College.

The Applied Mathematics will be taught partly in University College and partly in the School.

(VIII.) VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a Thesis (accompanied with drawings and specifications when necessary), during the subsequent vacation.

The student will also be required to make, during the vacation, full and clear notes of various constructions of engineering interest that may fall under his notice.

The value of both the Thesis and the construction notes will be taken into account in determining his standing at the next following examination.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.

Books of Reference.—Gillmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Any other works on the above subjects may be consulted, and results of original observation should be given.

II. CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES OF LECTURES.

I. Inorganic Chemistry.—A course on Elementary Inorganic Chemistry suited to the Pass Examination, University of Toronto; to the Medical Examination, First Year, University of Toronto; and to the First Year, Engineering Course, School of Practical Science.

A Course on the Application of Chemical Theory to Calculation for the First Year, Engineering Course.

A Course on Advanced Inorganic Chemistry for the Second Year, Honour Science Examination, University of Toronto.

A Course on the Theory of Qualitative Analysis for the Second Year, Honour Science Examination, University of Toronto.

II. Organic Chemistry.—A Course on Organic Chemistry for the Third Year, Honour Science Examination, University of Toronto.

A Course on Elementary Organic Chemistry, for the Medical Examination, Second Year, University of Toronto.

III. Historical Development of Chemical Theory.—A Course for the Fourth Year Examination in Science, University of Toronto.

IV. Physiological Chemistry.—A Course for the Fourth Year Examination in Science, University of Toronto.

V. Applied Chemistry.—A Course on the Chemistry of Combustion, Fuel, Furnace, Artificial Lighting and Explosives, suited to the Examination for Second Year, Engineering Course.

A Course on the Chemistry of Building Materials, Water, Air, and Sewage, and on Metallurgy, suited to the Examination for Third Year, Engineering Course.

PRACTICAL WORK IN THE LABORATORY.

I. Courses including Qualitative Analysis, suited to the Examinations for
(*a*) First Year, Engineering Course.
(*b*) Second Year, Honour Science, University of Toronto.
(*c*) First Year, Medicine, University of Toronto.

II. Courses including Quantitative and Qualitative Analysis, for
(*a*) Second Year, Engineering Course.
(*b*) Third Year, Honour Science, University of Toronto.

III. Physiological Chemistry for Second Year Examination in Medicine, University of Toronto.

IV. Forensic and Hygienic Chemistry for third Year Examination in Medicine, University of Toronto.

V. A Course for Fourth Year Examination in Science, University of Toronto.

III. MINERALOGY AND GEOLOGY.

COURSES OF LECTURES.

1. Elementary Course.—Rudiments of Mineralogy.
Geology and Palæontology.
Physical Geography.

Text Books and Books of Reference.—Chapman's Mineralogy and Geology of Canada, 3rd edition.
Dana's Manual of Mineralogy.
Dana's Text Book of Geology.
Page's Physicial Geography.
Johnston's Elementary Physical Atlas.

2. Advanced Course.—Mineralogy and Crystallography.
Geology and Palæontology.
Mathematics of Crystallography.
Physical Geography.
Geology and Palæontology of Canada.

Text Books and Books of Reference.—Dana's System of Mineralogy.
Chapman's Outline of the Geology of Canada, 1876.
Nicholson's Palæontology.
Chapman's Synopsis.

PRACTICAL COURSES.

1. Use of Blowpipe—Chapman's Blowpipe Practice.
Fee, $10.

2. Blowpipe Analysis, Determinative Mineralogy. Economic Minerals of Canada.

Keral's Leitfaden bei qual. u. quant. Lothrohr-Untersuchungen, etc. Aufl. 2. Plattner's Blowpipe Treatise. Von Kobell's Tafeln. Chapman's Mineral Tables.

$15.

3. Assaying.—Mitchell's Assaying, by Crooks.
Kerl's Probirkunst.
Chapman's Assay Notes.

Fee, $50.

4. Mining Geology.—*Books of Reference*—Burat's Géologie Appliquée and Cours d'Exploitation des Mines. Niederist's Bergbaukunde. Von Cotta's Erzlagerstatten.

Fee, $20.

IV. BIOLOGY.

Those students of the School of Practical Science who are required to take Biology as part of their course join the Arts Classes of the University of Toronto, which will be conducted henceforward in the New Building of the University Biological Department.

The following is the University Course in Biology for Arts Students. That for Medical Students will be found in the Calendar of the Medical Faculty.

The following arrangements will be in force during the year 1888-9 :

1. A course of Elementary Lectures on Biology will be given on Wednesdays and Fridays at 12 noon to prepare Candidates for the University Examination of the First Year.

2. A course of more advanced Lectures on Animal Physiology for Honor Students of the Second Year will be given three times a week at an hour to be arranged.

Text-Book—Yeo's Manual of Physiology.

3. Candidates for the Second Year Honor Examination in addition to attending the above Lectures will study Thomé's Lehrbuch der Zoologie as an introduction to the Zoology of the Vertebrata.

4. The Practical Course for Honor Students of the Second Year will be devoted to the methods of Biological Investigation, and to the study of typical forms of plants and animals, such as are treated of in Huxley and Martin's Elementary Practical Biology, new edition. Necessary Works of Reference will be found in the Laboratory. There will also be opportunities for the study of the Canadian Vertebrate Fauna (Text-book Jordan's American Vertebrates), and for a revision of the Canadian Flowering Plants, but the student is expected to have familiarized himself with the Canadian Flora during the preceding long vacation.

For Reference—Spotton's Canadian Flora or Gray's Manual.

5. Honor Students of the Third Year will study Cryptogamic Botany and Vegetable Physiology twice a week during the Michaelmas Term, and during the Easter Term the Zoology of the Invertebrata.

Books of Reference—1. Goebel's Outlines of the Classification of Plants.
2. Vines's Lectures on the Physiology of Plants.
3. Claus's Zoology, translated by Sedgwick.

6. The practical course for Third Year Students will be devoted to the study of typical forms of Cryptogamic Plants and Invertebrate Animals. In addition to the text-books referred to above Brooks's Invertebrate Zoology will be required.

7. Wiedersheim-Parker's Elements of Comparative Anatomy of the Vertebrata, and Foster's Physiology, last English edition, are recommended for Honor Students of the Fourth Year, and the following works will be required in the Practical Course :

1. Klein's Elements of Histology.
2. Parker's Zootomy.
3. Foster and Balfour's Embryology.
4. Charles' Physiological Chemistry.

Works of reference on Bacteriology and the other subjects specified in the University Curriculum will be found in the Laboratory.

8. Students of all years are required to provide themselves with dissecting instruments, slides, cover-glasses, etc., and to pay a Laboratory fee for the use of microscopes and material for study.

V. MATHEMATICS AND PHYSICS.

The ordinary course embraces Euclid, Algebra, Plane Trigonometry, Statics of Solids and Fluids, Dynamics of a Particle, Geometrical Optics, Sound, Heat, Electricity, and Plane Astronomy.

The lectures in Physics will be fully illustrated by experiments.

The advanced course embraces Spherical Trigonometry, Analytical Geometry (Plane and Solid), Differential and Integral Calculcus, Theory of Equations, Statics of Solids and Fluids, Particle and Rigid Dynamics, Hydrodynamics, Optics, Acoustics, Thermo-dynamics, Electricity, and Astronomy.

VI. ETHNOLOGY.

Anthropology. The Skull, its bones and sutures. Structure and functions of the brain. Typical race-forms of head. Hair, colour and other distinctive ethnical elements. Succession of races. The Prehistoric, Unhistoric, and Historic races.

Physical evidences of diversity of race.

Philological evidence.

The lectures are illustrated by means of maps, drawings, specimens of typical skulls, primitive implements, etc.

Text-Books.—Tylor's Anthropology: an introduction to the study of Man and Civilization.
Brace's Manual of Ethnology.
Latham's Ethnology of British Isles.
" Ethnology of Europe.
" Man and his Migrations.
Max Müller's Science of Language, 1st Series.

Additional Books of Reference—Pritchard's Researches into the Physical History of Man.
Pritchard's Eastern Origin of the Celtic Language (Latham's Ed.)
Latham's Varieties of Man.
Neibuhr's Ethnography.
Wilson's Prehistoric Man (3rd Ed.)

PHYSICAL LABORATORY AND WORKSHOP.

The Physical Laboratory which has been lately established in connection with University College is furnished with a large collection of apparatus for lecture experiments in the departments of Mechanics, Sound, Light, Heat and Electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an Elementary Laboratory, there are several special Laboratories, which offer unusual facilities for the conduct of experiments in the various branches of Physics.

The electrical apparatus include Electrometers, Galvanometers, Resistance Coils and Bridges, Testing Keys, Batteries, Electrical Machines (Holz and Carré), Ruhmkorff Coils, Crookes' Tubes, Telephones, etc., etc.

The workshop contains a gas engine, lathes and other tools.

MODERN LANGUAGES.

Students in the regular courses are admitted, without extra charge, to the French and German classes in University College (see regulation 10). No special examinations are held in these languages, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, ETC.

The Library, Museums and Herbarium of the University of Toronto are open to regular students.

CALENDAR

OF THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and of the Regulations for Diplomas.

Twelfth Session, 1889-90.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1889.

Faculty of the School.

SIR DANIEL WILSON, LL.D., F.R.S.E., CHAIRMAN OF THE BOARD.

MEMBERS OF THE BOARD.

E. J. CHAPMAN, Ph.D., LL.D..... .....*Professor of Mineralogy and Geology.*
JAMES LOUDON, M.A.....*Professor of Physics.*
R. RAMSAY WRIGHT, M.A., B.Sc.....*Professor of Biology.*
J. GALBRAITH, M.A., ASSOC. M. INST. C.E.*Professor of Engineering.*
W. H. PIKE, M.A., Ph.D.....*Professor of Chemistry.*
SIR DANIEL WILSON, LL.D., F.R.S.E..*Professor of Ethnology.*
W. H. ELLIS, M.A., M.B. .....*Professor of Applied Chemistry.*
ALFRED BAKER, M.A.....*Professor of Mathematics.*

ASSISTANT INSTRUCTORS, 1888-9.

W. J. LOUDON, B.A.....*Demonstrator in Physics.*
F. W. BABINGTON.....*Demonstrator in Applied Chemistry.*
A. B. MACALLUM, B.A., M.B., Ph.D....*Lecturer in Physiology.*
L. B. STEWART, P.L.S., D.T.S.....*Lecturer in Surveying.*
J. McGOWAN, B.A.....*Fellow in Mathematics.*
J. G. WITTON, B.A.....*Fellow in Physics.*
J. J. McKENZIE, B.A .....*Fellow in Biology.*
G. CHAMBERS, B.A.....*Fellow in Chemistry.*
F. G. WAIT, B.A.....*Fellow in Mineralogy and Geology.*
D. BURNS, GRAD. S. P. S.....*Fellow in Engineering.*

SECRETARY OF THE BOARD:

H. H. LANGTON, B.A.,

To whom application may be made for information further than that contained in the present Calendar.

Engineering Department.

SESSION 1888-9.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

1st Year.

Allan, J. R.
Beatty, H. J.
Boulton, W. R.
Cant, G. F.
Deacon, T. R.
Dill, C. W.
Dunbar, M.
Hill, V.
Lane, Andrew.
Lawson, W.
Langley, C. E.
Macallum, A. F.
McAllister, J. E.
McCollum, T. E. B.
McLennan, R.
McPherson, C. W.
Moore, J. E. A.
Newman, Wm.
Paterson, J. E.
Playfair, N. L.
Robinson, J. K.
Ross, J. A.
Russell, Wm.
Smith, Angus.
Sylvester, G. E.
Symmes, H. D.
Thomson, R. W.
Warren, E. C.

2nd Year.

Bowman, F. M.
Bucke, M. A.
Corrigan, G. D.
Duff, J. A. (B.A.)
Eaman, J. A.
English, A. B.
Garland, N. L.
Hutcheon, J.
Innes, W. L.
Meade, H.
Merrill, E. B.
Pedder, J. R.
Peterson, C. E.
Wiggins, T. H.

3rd Year.

Carey, Brock.
Chalmers, W. J.
Clement, W. A.
Hanning, G. F.
Haultain, H. E. T.
Irvine, J.
James, D. D.
Mill, F. X.
Moberly, H. K.
Ritchie, N. T.
Rosebrugh, T. R. (B.A.)
Shillinglaw, W. H.
Wickett, T.
Withrow, W. J.

MECHANICAL ENGINEERING.

2nd Year.

Ross, R. A.

SPECIAL STUDENTS.

Mechanical Engineering.

Hanly, J. B. — Hale, W. B. — Wickson, F. R.

Mining Engineering.

Chewett, H. J. (Grad. S. P. S.)

Surveying.

Cameron, A J. — Fawcett, Adam. — Fitzgerald, J. — Johnston, T. R. (B.A.)

Drawing.

Fawell, J. H. — Mickle, A. — Topp, C. W.

GRADUATES.

Note.—Graduates are requested to inform the Professor of Engineering as to changes in their addresses.

1881.—J. L. Morris, C.E., P.L.S., Pembroke.

1882.—J. McAree, P.L.S., D.T.S., Toronto.
D. Jeffery, Contractor, Winnipeg.
J. H. Kennedy, C.E., Architect, etc., St. Thomas, Ont.

1883.—G. H. Duggan, Dominion Bridge Co., Montreal.
J. W. Tyrrell, P. and D.L.S., Toronto.
D. Burns, Fellow in Engineering, School of Practical Science, Toronto.

1884.—E. W. Stern, Kansas City, Mo.
A. R. Raymer, Assistant Engineer, Canadian Pacific Railway, Greenville, Maine.
J. Robertson, P.L.S., Coad & Robertson, Civil Engineers, P.L. Surveyors, etc., Glencoe, Ont.
W. C. Kirkland, Canadian Pacific Railway.
J. McDougall, B.A., Canadian Pacific Railway.

1885.—B. A. Ludgate, P.L.S., Peterboro', Ont.
O. McKay, P.L.S., Windsor.
E. E. Henderson, P.L.S., Canadian Pacific Railway, Brownville, Maine.
F. W. Bleakley, care of A. W. Keadie, Quincy, California.
H. J. Bowman, P. and D.L.S., Berlin, Ont.

1886.—T. K. Thomson, Pencoyd Bridge and Construction Co., Penn.
H. G. Tyrrell, Pencoyd Bridge and Construction Co., Penn.
R. Laird, P.L.S.. Toronto,
A. M. Bowman, P. and D.L.S., Berlin, Ont.
E. B. Hermon, P. and D.L.S., Vancouver, British Columbia.

1887.—A. E. Lott, Atcheson, Topeka and Santa Fee Railway, Topeka, Kansas.
J. Roger, Fullerton, Ont.
J. C. Burns, Architect's Office, Toronto.
C. H. Pinhey, P. and D.L.S., 630 Wellington Street, Ottawa.
A. L. McCulloch, Galt.
F. Martin, Surveyor's Office, Orangeville.

1888.—J. F. Apsey, P.L.S., Toronto.
W. T. Ashbridge, City Engineer's Office, Toronto.
E. F. Ball, Niagara, Ont.
D. B. Brown, Cornwall, Ont.
C. M. Canniff, City Engineer's Office, Toronto.
H. J. Chewett, Toronto.
J. Gibbons, Renfrew, Ont.
R. McDowall, Toronto.
G. W. McFarlen, Surveyor's Office, Toronto.
C. J. Marani, Toronto.
G. R. Mickle, B.A., Toronto.
J. H. Moore, Newmarket, Ont.
G. H. Richardson, Can. Pacific Railway, Toronto.
K. Rose, Riverdale, California.
J. E. Ross, Beachburg, Ont.
C. H. C. Wright, 56 Maverick Street, Chelsea, Mass.

FELLOWSHIP IN ENGINEERING.

A Fellowship of the value of $500 per annum, paid in eight monthly instalments, has been established, open only to Graduates in Engineering of the School.

The Fellow is required to take such portions of the work of instruction as may be assigned to him by the Professor of Engineering.

Candidates for the Fellowship are required to make written application to the Secretary on or before 20th September.

PRIZEMEN.

1879.—	I. Year	J. McAree	1st prize.
1880.—	II. Year	J. L. Morris	1st prize
1881.—	I. Year	G. H. Duggan	1st prize.
	II. Year	D. Jeffrey	1st prize.
1882.—	I. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	II. Year	G. H. Duggan	1st prize.
	III. Year	D. Jeffrey	1st prize.

1883.—	I. Year	B. A. Ludgate	1st prize
	" "	A. M. Bowman	2nd prize.
	II. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	III. Year	G. H. Duggan	1st prize.
1884.—	II. Year	B. A. Ludgate	1st prize.
	III. Year	E. W. Stern	1st prize.
	" "	A. R. Raymer	2nd prize.
1885.—	I. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
	II. Year	T. K. Thompson	1st prize.
	III. Year	B. A. Ludgate	1st prize.
1886.—	I. Year	C. H. C. Wright	1st prize.
	" "	J. E. Ross	2nd prize.
	II. Year	A. E. Lott	1st prize.
1887.—	I. Year	H. E. T. Haultain	1st prize.
	II. Year	C. H. C. Wright	1st prize.
	III. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
1888.—	I. Year	E. B. Merrill	1st prize.
	I. Year	F. M. Bowman	2nd prize.
	II. Year	D. D. James	1st prize.
	III. Year	C. H. C. Wright	1st prize.

UNIVERSITY OF TORONTO.

DEGREE OF C. E.

Date of Admission.	
1885	J. L. Morris
1886	J. H. Kennedy.

Department of Analytical and Applied Chemistry.

Regular Students.

2nd Year.

BOUSTEAD, W. JAMES, O. S.

Special Student.

TOBEY, C. W.

School of Practical Science,

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1889-90.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education, confirmed by the Lieutenant-Governor in Council, on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College, whereby the students of the School of Practical Science enjoy full advantage of the instruction given by its Professors and Lecturers in all departments of Science embraced in the work of the School. In addition to this, the Faculty of the School of Science includes Professors of Engineering and Applied Chemistry, and assistants in the several departments.

The position which it is intended that the School of Practical Science shall occupy in the educational system of Ontario may be indicated as follows :—

I.—Students, who have passed through the regular courses of the School, will be enabled to prosecute professionally : (1) Engineering ; (2) Assaying and Mining Geology ; or (3) Analytical and Applied Chemistry. With this view, Diplomas will be granted in each of those branches after due examination.

The instruction in Engineering is designed to give the student a thorough knowledge of the scientific principles of the Profession, and also to afford such practical training in drawing and surveying as will make him immediately useful in the office and field.

The establishment of a Diploma for special qualifications in Assaying and Mining Geology, apart from the knowledge of these subjects incidental

to the course of Mining Engineering, is called for by the necessity which exists for the development of the mineral wealth of the Province. Students who pass through the course necessary to obtain this Diploma will have acquired the knowledge requisite for inspecting and surveying mineral lands, as well as the ability to report accurately on the composition and value of economic minerals generally.

The importance of the study of Chemistry is now fully recognized, and in Canada, through the Public Analysts and otherwise, protection is being secured to consumers, while the producers are necessarily brought to recognize its importance. The course in Chemistry is such as to fit the student for the position of Public Analyst or of Consulting or Resident Chemist.

II.—It is designed to furnish preliminary scientific training for students entering the professions of Surveying and Medicine.

Certificates in Surveying will be granted after due examination, which will have the effect of shortening the ordinary period of apprenticeship to a Land Surveyor, by the length of time covered by such certificates—one, two or three Sessions, as the case may be.

The School of Practical Science offers to Medical Students thoroughly practical courses of instruction in those sciences which form the best preliminary training for the study of Medicine. The Lectures and Laboratory Courses are arranged so as to conform with the Regulations of the University of Toronto.

III.—Persons desirous of instruction in any of the subjects taught in the School, may be allowed to attend separate courses in these, as *Special Students*.

ARCHITECTURE.

Students who intend to pursue Architecture as a profession, are advised to take, if possible, the regular course in civil engineering, as the instruction given in this course in the subjects of Drawing, Colouring, Principles of Construction (Carpentry, Masonry and Iron work), Strength and other Properties of Building Materials, Flow of Water and Air, Theory of Heat, etc., will be as useful to them as to civil engineers. They may enter as special students if they please.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour the Lieutenant-Governor in Council the 16th day of April, 1889.

1. The internal management and discipline of the School shall be vested in the Board consisting of the Professors and the Chairman, as nominated by the Lieutenant-Governor in Council.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December; and the Second Term from 8th January to 18th April.

3. There shall be three Departments in which Diplomas shall be granted, viz :—

(1) Engineering.
   (*a*) Civil Engineering (including Mining Engineering).
   (*b*) Mechanical Engineering (including Electrical Engineering).
(2) Assaying and Mining Geology.
(3) Analytical and Applied Chemistry.

A Diploma shall be granted to each student who shall have completed to the satisfaction of the Faculty, the Regular Course in any of the above Departments.

4. The Regular Course for the Diploma of the School in each Department is three years in duration.

5. A student who proposes to obtain the Diploma of the School in one of the above Departments must have passed the Matriculation Examination required for admission to a University in any part of Her Majesty's Dominions, or the Entrance Examination of the Law Society of Upper Canada, or of the College of Physicians and Surgeons, or any of the Examinations prescribed for Teachers in Public or High Schools of the Province of Ontario, or must present a certificate signed by a Head Master of a High School or Collegiate Institute, that he possesses qualifications equivalent to those required for such teachers.

6. Special Students may be permitted to attend such lectures or courses of instruction or of practical work, as the Board may think proper.

7. Certificates of attendance and standing may be given upon due examination to Special Students, and such students shall not be required to pass an Entrance Examination.

(6 and 7 apply to Medical Students taking special work, also students preparing themselves to be Surveyors, Architects, etc.)

8. At the end of the session, examinations will be held in the different subjects taught, and prizes will be awarded for excellence in each Department. Candidates for Diplomas and Certificates are required to enter for these.

9. All Regular Students are required to be in attendance at the School during the whole of each term, unless exempted by special permission of the Board. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Board for bad conduct, and adjudged guilty thereof.

10. Students of the School of Practical Science shall attend such courses of lectures as are delivered by the Professors of the University College to the students thereof, so far as applicable to both classes of students, while instruction of a practical character in the Department of Engineering is especially appointed for students of the School.

REGULATIONS RESPECTING EXAMINATIONS.

Approved by the Board, March 8th, 1889.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Board.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry and Surveying, the following minimum number of drawings must be made in the respective years :—

Civil Engineering.	No. of Drawings.	Mechanical Engineering.	No. of Drawings.
I Year.—Applied Mechanics....	8	.....	13
Descriptive Geometry.	6	.....	10
Surveying	9		
II Year.—Applied Mechanics....	7	.....	11
Descriptive Geometry.	12	.....	12
Surveying	4		
III Year.—Applied Mechanics....	8	.....	12
Descriptive Geometry.	11	.....	11
Surveying	4		

The above minimum number of drawings will include only such drawings as shall be specially prescribed for the purpose.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the 1st term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned minimum number of drawings must be made, together with as many practice sheets as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum percentage of marks prescribed for practical work must be obtained in drawing.

The marks allotted to the above-mentioned minimum number of drawings form two-thirds of the total marks allotted in this subject.

The drawings must be made on paper 15 x 22 inches, unless otherwise prescribed.

The Board reserves the right of disposing of the drawings as they may think proper. No drawing may be removed from the school without permission.

No drawings will be counted which have not been made in the drafting rooms and during the hours allotted to such work.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No field notes will be counted which have not been taken in the field and during the hours allotted to such work.

Vacation Work must be handed in during the first week of the ensuing session, otherwise it will not be counted.

Vacation notes must be on construction only and consist of not less than 20 nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must consist of not less than 20 nor more than 30 ordinary foolscap pages.

The minimum percentage of marks required for practical work will be required in the case of vacation notes and theses.

No notes whatever, whether made during the session or the vacation will be counted unless made in the standard note books of the School.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the

minimum percentage required for practical work in the *written* examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations will begin on the first day of the session.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year will be required to take the whole course of instruction, both theoretical and practical, over again before presenting themselves a second time for examination.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between nine a.m. and five p.m. in the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted unless under such exceptional circumstances as may be deemed sufficient by the Board, and which must be fully set forth in a formal petition.

Prizes.

Two prizes are open for competition in each year ; the first prize of the value of $10.00, the second of $5.00.

These will be awarded to the students who stand first and second in general proficiency in the subjects of the year, under the following conditions, viz. :—

The candidate must have passed in each subject and have obtained at least 75 per cent. of the total number of marks allotted to the subjects.

The following is an approximate list of the examinations to be held and of their relative values in the competition for prizes :—

I. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Algebra.	100....	Statics.
100....	Euclid.	100....	Dynamics.
100....	Plane Trigonometry.	100....	Descriptive Geometry.
100....	Analytical Geometry.	100....	Surveying.
		100....	Chemistry, Elementary.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....	*Field Notes.
30.....	Construction Notes.
100	†Experimental Physics.

II. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Calculus.	100....	Strength of Materials.
100....	*Astronomy.	100....	Rigid Dynamics.
100....	Optics.	100....	†Theory of Mechanism.
100....	Hydrostatics.	100....	Descriptive Geometry.
100....	†Magnetism & Electricity.	100....	*Surveying.
		100....	Spherical Trigonometry and Geodesy.
		100....	Chemistry, Theoretical.
		100....	Chemistry, Practical.
		100....	*Mineralogy and Geology.
		100....	*Mineralogy, Practical.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....	*Field Notes.
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of term).

* Civil Engineering only. † Mechanical Engineering only.

III. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Method of Least Squares.	100....	Theory of Internal Stress.
		100....	Theory of Construction.
		100....	†Mechanics of Machinery.
		100 ...	†Machine Design.
		100....	Hydraulics.
		100 ...	Thermodynamics.
		100....	Descriptive Geometry.
		100....	*Practical Astronomy and Geodesy.
		100....	*Surveying and Levelling.
		100....	Chemistry, Applied.
		100....	*Mineralogy and Geology.
		100 ..	*Mineralogy, Practical.

The III. year candidates are also required to take the following papers of the I. and II. years :—

	Value.	Subject.
I. Year.—	100.....	Statics.
	100.....	Dynamics.
II. Year.—	100.....	Spherical Trigonometry and Geodesy.
	100.....	Strength of Materials.
	100.....	Rigid Dynamics.
	100.....	†Theory of Mechanism.

Examinations held during the Session.

Value.	Subjects.
300.....	Drawings.
100.....	*Field Notes.
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).

Lectures close April 4th, 1890.
Examinations begin April 10th, 1890.

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* Civil Engineering only. † Mechanical Engineering only.

REGULAR COURSES FOR THE DIPLOMA

See regulations 2, 3, 4, 5, 8, 9, 10 : pp. 12 and 13.

The fees (payable through the Secretary to the Provincial Treasurer) for instruction in any of the Departments, are as follows :—

First Session : Thirty Dollars.

Second Session : Forty Dollars.

Third Session : Fifty Dollars.

These are payable in two instalments, one at the beginning of each term. There is no extra fee for Diploma.

The following are the Departments in which the Diploma is granted :—

(1) Engineering.
   (*a*) Civil Engineering (including Mining Engineering).
   (*b*) Mechanical Engineering (including Electrical Engineering).
(2) Assaying and Mining Geology.
(3) Analytical and Applied Chemistry.

FORM OF DIPLOMA.

THE

School of Practical Science,

PROVINCE OF ONTARIO.

(ESTABLISHED 1878.)

THIS IS TO CERTIFY *that*

.....

of the.....*in the*.....

....*has completed the Regular Course of this School for the Diploma in the*.....

extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz. :

.....

.....

.....

WHEREFORE *the said*.....

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

.....*One thousand eight hundred and*.....

and have caused the Seal of this School to be hereunto affixed.

.....*Chairman.*

[L. S.]

.....*Secretary.*

ESTIMATED EXPENSES IN THE DEPARTMENT OF ENGINEERING.

NOTE.—Each Student is required to furnish himself with the following drawing instruments and materials, viz. :—

One drawing-board, 23″ × 31′ ; 1 T square, 31 inch ; 2 set squares, 60° and 45°, not less than 6″ on the side ; 1 6″ (or larger) protractor ; 1 12″ triangular scale, containing 10, 20, 30, 40, 50 and 60 chain scales ; 1 12″ triangular scale, containing $\frac{1}{16}$, $\frac{1}{8}$; $\frac{1}{4}$, $\frac{1}{2}$; 1, 2 ; $\frac{3}{8}$, $\frac{3}{4}$; $1\frac{1}{2}$, 3 ; $\frac{1}{5}$, $\frac{1}{10}$ open divided scales ; 1 drawing pen ; 1 pair dividers ; 1 pair compasses with ink and pencil points, lengthening bar, etc. ; 1 set spring bows, crow-quill pens, French curves, 1 2ft. pocket rule, Arkansas oil stone, thumb-tacks, paper, tracing vellum, pencils, rubber, colors, sponge, brushes, nest of saucers, water mug, etc., and one portfolio for drawings.

The expenses for the Regular Course in the Department of Engineering are approximately as follows :—

Sessional Fees	$120 00
Books, instruments, drawing materials, laboratory fees, etc	120 00
Total	$240 00

These expenses are divided equally between the three sessions.

Each student in this department is required to deposit $1 per annum for the purpose of covering breakages and losses occurring to apparatus and furniture.

Making this deposit will, however, not free any student from the liability to make good any loss or damage to instruments or furniture, arising from want of proper care on his part, when the above fund may prove insufficient for the purpose.

DEPARTMENT OF

TIME TABLE OF REGULAR

Instruction will be given during the Session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Elementary Chemistry.	Drawing.
10-11	Elementary Chemistry.	Drawing.
11-12	*Geometry & Trigonometry	Drawing.
12-1	Statics.	Descriptive Geometry.
1-2		
2-3	Drawing.	Surveying (lecture).
3-4	Drawing.	Field Work.
4-5	Drawing.	Field Work.

SECOND YEAR.

9-10	Strength of Materials.	*Astronomy.
10-11	*Physics (Hydrostatics and Optics).	*Physics (Hydrostatics and Optics).
11-12	Drawing.	Chemistry.
12-1	Drawing.	Drawing.
1-2		
2-3	*Experimental Physics.	Applied Chemistry.
3-4	*Experimental Physics.	Applied Chemistry.
4-5	El. Mineralogy & Geology.	Field Work.

THIRD YEAR.

9-10	Drawing.	Applied Chemistry.
10-11	Drawing.	Astronomy and Geodesy.
11-12	Theory of Internal Stress.	Constructive Design.
12-1	Drawing.	Mineralogy.
1-2		
2-3	Constructive Design.	Thermo-dynamics.
3-4	Drawing.	Field Work.
4-5	Drawing.	Field Work.

*In University College.

Additional lectures are given at hours not specified in above time-table and when the weather will not permit of field work.

ENGINEERING.

COURSE IN CIVIL ENGINEERING.

1889-90, according to the subjoined Programme.

WEDNESDAY.	THURSDAY.	FRIDAY.
FIRST YEAR.		
Drawing.	Drawing.	Drawing.
Statics.	*Conics.	*Algebra & Trigonometry.
Elementary Chemistry.	Drawing.	Drawing.
	Field Work.	Field Work.
SECOND YEAR.		
Strength of Materials.	*Astronomy.	*Calculus.
*Calculus.	Descriptive Geometry.	*Physics (Hydrostatics and Optics).
Chemistry.	*Physics (Hydrostatics and Optics).	Practical Chemistry.
Applied Chemistry.	Spherical Trigonometry.	
Rigid Dynamics.	Applied Chemistry.	Theory of Surveying Instruments.
Drawing.	Practical Mineralogy (*b*).	Field Work.
El. Mineralogy & Geology.	Field Work (*a*).	
THIRD YEAR.		
Drawing.	Drawing.	Applied Chemistry.
Hydraulics (*b*).		Astronomy & Geodesy.
Descriptive Geometry.	Practical Mineralogy.	Constructive Design (*a*).
Drawing.	Drawing.	Hydraulics (*b*).
		Drawing.
Rigid Dynamics.	Thermo-dynamics.	Experimental Physics(*b*)
Drawing.	Field Work.	Field Work (*a*).

(*a*) During First Term. (*b*) During Second Term.

This time-table is subject to modification, when necessary, to prevent conflict of hours.

DEPARTMENT OF

TIME TABLE OF REGULAR COURSE

Instruction will be given during the Session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Elementary Chemistry.	*Experimental Physics.
10-11		
11-12	*Geometry & Trigonometry	Drawing.
12-1	Statics.	Descriptive Geometry.
1-2		
2-3	Drawing.	Surveying (lecture).
3-4		Drawing.
4-5		

SECOND YEAR.

9-10	Strength of Materials.	Drawing.
10-11	*Physics.	*Physics.
11-12	Drawing.	Chemistry.
12-1		Drawing.
1-2		
2-3	Drawing.	Applied Chemistry.
3-4	*Experimental Physics.	Drawing.
4-5		

THIRD YEAR.

9-10	Drawing.	Applied Chemistry.
10-11		Machine Design.
11-12	Theory of Internal Stress.	Drawing.
12-1	Drawing.	
1-2		
2-3	*Experimental Physics.	Thermo-dynamics.
3-4		Drawing.
4-5		

*In University College.

This time table is subject to modification, when necessary, to prevent conflict of hours.

ENGINEERING.

IN MECHANICAL ENGINEERING.

1889-90, according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Drawing.	*Experimental Physics.	Drawing.
	Drawing.	*Algebra & Trigonometry.
Statics.	*Conics.	Dynamics (*b*).
Elementary Chemistry.	Drawing.	Drawing.

SECOND YEAR.

Strength of Materials.	Theory of Mechanism.	*Calculus.
*Calculus.	Descriptive Geometry.	*Physics.
Chemistry.	*Physics.	Practical Chemistry.
Practical Chemistry.	Spherical Trigonometry.	
Rigid Dynamics.	Applied Chemistry.	Theory of Mechanism.
Drawing.	Drawing.	Drawing.

THIRD YEAR.

Drawing.	Drawing.	Applied Chemistry.
Hydraulics (*b*).	Mechanics of Machinery.	Machine Design.
Descriptive Geometry.	Drawing.	Hydraulics (*b*).
Drawing.		Drawing.
Rigid Dynamics.	Thermo-dynamics.	*Experimental Physics.
*Experimental Physics.	Drawing.	

(*b*) During Second Term.

I. DEPARTMENT OF ENGINEERING.

CIVIL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Mining Engineers).

Students who wish to devote themselves to the practice of Mining Engineering are allowed to take the work specially mentioned under this head, in the Third Year, and to omit the work in Experimental Physics.

They are advised, however, to take, if possible, the regular course in Civil Engineering and the special work subsequently as Special Students.

Subjects of the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry, Analytical Geometry of two dimensions.

Mechanics.

Statics and Dynamics (with special reference to Structures and Machines).

Drawing.

Copying from the Flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids. Orthographic (including Isometric) and Oblique Projection.

Surveying.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary Instruction in use of the Transit and Theodolite—Plotting, Mensuration.

Chemistry.

Elementary Chemistry, with Laboratory Practice.

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

EXPERIMENTAL PHYSICS.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Telescope and Microscope, and Reflecting instruments.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and Structures. (Drawings made from both copies and original notes).

ENGINEERING AND SURVEYING.

Theodolite Surveying (including laying out Railway Curves).
Principles of Geodesy (considering the Earth a Sphere).
Statics and Dynamics. (Pure and applied).
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.
Theory of the Theodolite, Transit-Theodolite, Level, and Sextant.

CHEMISTRY.

General Chemistry.
Practical Chemistry.
Chemistry (Applied).
Combustion, Fuel, and Furnaces.
Metallurgy of Iron and Steel.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

Subjects of the Third Year.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry. Principle of Least Squares.

Drawing.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

Engineering and Surveying.

Subjects of previous years continued.
Levelling. Setting out Excavation, Cross-sectioning, Calculation of Quantities.
Applied Mechanics.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.
Application of Principles to practical problems connected with the design and construction of various Structures and Machines, *e. g.*, Foundations, Retaining Walls, Arches, Roofs, Bridges, Roads, Railways, Canals, Sewers, Water Wheels, Steam Engines, Hydraulic Machinery, Mining Machinery, etc.
Practical Astronomy.
Geodesy (Considering the Earth a Spheroid.)

Chemistry (Applied.)

Artificial Lighting.
Photography.
Explosives.
Mortars and Cements.
Bricks and Artificial Stones.
Preservation of Wood, Iron and Stone.
Water, Air and Sewage.
*Metallurgy, with special reference to Copper, Lead, Silver and Gold.

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* Mining Engineering only.

Mineralogy and Geology.

Economic Minerals of Ontario.
Blowpipe Analysis and Determinative Mineralogy.
*Assaying and Mining Geology, Mining Calculations.
*Crystallography and Palæontology.

MECHANICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical Engineers (including under this term Electrical Engineers.)

Subjects of the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Geometry of two dimensions.

Mechanics.

Statics and Dynamics (with special reference to Structures and Machines).

Experimental Physics.

Light : Use of the Heliostat and Spectroscope.
Experiments with Lenses and Mirrors.
Theory of the Microscope and Reflecting Instruments.

Drawing.

Copying from the Flat, Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

Chemistry.

Elementary Chemistry with Laboratory Practice.

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*Mining Engineering only.

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Physics.

Hydrostatics.
Optics.
Magnetism.
Electricity.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry.
Principle of Least Squares.

Drawing.

Subjects of first year continued.
Coloring and Shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and Structures. (Drawings made from both copies and original notes.)

Engineering.

Statics and Dynamics (Pure and Applied).
Theory of Mechanism.
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.

Chemistry.

Theoretical Chemistry.
Practical Chemistry.

Chemistry (Applied).

Combustion, Fuel and Furnaces.
Metallurgy of Iron and Steel.
Laboratory Practice.

Subjects of Third Year.

Experimental Physics,

Acoustics.
Electrical Measurements and Testing.

Drawing.

Subjects of previous years continued.
Descriptive Geometry :
Shades and Shadows.
Stone cutting.
Perspective Projection.

Original Designs.

Engines, Water Wheels, Shafting, Belting and Gearing, Machines, etc.

Engineering.

Subjects of previous years continued.
Applied Mechanics:
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.
Application of Principles to Practical Problems connected with the design, construction and testing of various Prime Motors and Machines.

Chemistry (Applied).

Artificial Lighting.
Photography.
Explosives.
Preservation of Wood, Iron and Stone.
Metallurgy.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one or more of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam-engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and the Survey of Lands.

12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service ; or, in case he has only received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service ; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The fee for special students in Surveying is $30 per session.

The attention of Candidates for the Diploma of D.T.S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

DEGREE OF C.E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884 :—

DEGREE OF C.E.

By the Senate of the University of Toronto.

Be it enacted :

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C.E. be hereby established, to be granted subject to the following conditions and regulations :—

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.

5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.

6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates ; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.

7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate, not later than the first day of February.

8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.

9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.

10. The examination of the essay, drawings and estimates, and any further examination of the candidate that may be considered necessary, may be held in May.

11. The fee for the degree of C.E. shall be $20, and shall be paid to the Registrar not later than the first day of May.

12. The essay, drawings and estimates, submitted by the candidate, shall be the property of the University.

2. DEPARTMENT OF ASSAYING AND MINING GEOLOGY.

In this Department the student is fully prepared in all the methods of analysis necessary to render him a competent Assayer. He is also qualified to survey and report upon the value of mineral lands.

SUBJECTS OF FIRST YEAR:

1. Elementary Mathematics, including Mensuration and Plane Trigonometry.
2. Elements of Natural Philosophy, including Mechanics and Hydraulics.
3. Inorganic Chemistry.
4. Elementary Mineralogy and Blowpipe Practice.
5. Elementary Biology.
6. Physical Geography, Palæontology and Geology.
7. Drawing.

SUBJECTS OF SECOND YEAR:

1. Higher Mathematics, including Spherical Trigonometry, etc.
2. Chemistry, with Laboratory practice in Qualitative Analysis.
3. Blowpipe Analysis and Determinative Mineralogy.
4. Geology and Economic Minerals of Canada.
5. Surveying and Levelling.

SUBJECTS OF THIRD YEAR:

1. Quantitative Chemical Analysis.
2. Metallurgy.
3. Assaying.
4. Study of Metallic Veins and other Mineral Deposits, Mining Calculations, Examinations of Mineral Lands.

3. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is under the charge of the Professor of Applied Chemistry.

The course is intended to render the student proficient in all the methods of Analytical Chemistry, and to fit him for such positions as that of Public Analyst, Consulting Chemist in regard to Manufactures, or Resident Chemist in manufactories where such is required.

SUBJECTS OF FIRST YEAR :

1. Algebra, Euclid and Plane Trigonometry.
2. Natural Philosophy, with work in Laboratory.
3. Elementary Biology.
4. Inorganic Chemistry, Elementary and Advanced, with work in the Laboratory.

SUBJECTS OF SECOND YEAR :

1. Elementary Mineralogy and Geology.
2. Blowpipe Practice and Assaying.
3. Organic Chemistry with Applied Chemistry, Laboratory work in Qualitative and Quantitative Analysis.

SUBJECTS OF THIRD YEAR :

Candidates are expected to be able to read Chemical Works in the French and German languages.

1. Applied Chemistry.
2. Inorganic Chemistry, including Thermo-Chemistry and the study of Mendelejeff's Periodic Law. Advanced Organic Chemistry, Historical Development of Chemical Theory, and Physiological Chemistry.
3. Laboratory Works, including Technical Analysis, Quantitative Mineral Analysis, a prescribed course in Physiological Chemistry, and in Chemis'ry in its relations to Hygiene and Forensic Medicine.

Synopsis of the Courses of Lectures

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT,

WITH FEES FOR SPECIAL STUDENTS.

Special Students are advised to enter at the beginning of the Session (October 1st), as many subjects begun in the First Term are continued through the Second, and Lectures cannot be repeated.

I. ENGINEERING.

(Reductions will be made to Special Students taking Several Courses.)

☞ Text-books for the First Year marked (*a*); for Second Year, (*b*); for Third Year, (*c*).

(I.) DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text Books and Books of Reference.—Davidson's Projections.
Angel's Plane and Solid Geometry.
Binn's Orthographic Projection.
Church's Descriptive Geometry (*a*), (*b*), (*c*).
Warren's Stone Cutting (*c*).
McCord's Lessons in Mechanical Drawing.
Worthen's Topographical Drawing (*a*), (*b*), (*c*).

Fees for Special Students, $10.

(II.) SURVEYING AND LEVELLING.

Land Surveying—

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

Levelling—

Longitudinal and Cross sections.
Plotting.

Setting Out—

Setting out Straight Lines and Curves.
Setting out Levels.

Mensuration—

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*).
Henck's or Trautwine's Railway Curves (*b*).

Fees for Special Students, $10.

(III.) GEODESY AND PRACTICAL ASTRONOMY.

Geodesy—

Field Work.
Computation of the Triangles (considering the Earth, 1st as a Sphere ; 2nd, a Spheroid).
Determination of the Figure of the Earth.

Practical Astronomy—

Methods of determining Latitude, Local Time, Direction of the Meridian, and Difference of Longitude.
Theory of the Theodolite, Transit-Theodolite, Level, Sextant, and Solar Compass.

Text Books.—Gillespie's Higher Surveying (*b*), (*c*).
Chauvenet's Spherical and Practical Astronomy (*c*).
Nautical Almanac for 1890 (*c*).
Chambers' Practical Mathematics (*c*).
Fee for Special Students, $15.

(IV.) APPLIED MECHANICS.

STATICS—

The Calculation of the Stresses in Framed Structures, Solid and Rivetted Beams, Stone Arches, etc. Both Graphical and Analytical Methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS—

DESIGNING OF STRUCTURES in Timber, Iron and Masonry—Arches, Retaining Walls, Foundations, Roofs, Bridges, etc.

DYNAMICS—

Representation and Measurement of Forces and Motions.
Principles of *Work* and *Energy*.
Efficiency of Machines. Friction.
Transmission of Energy—Belts, Shafts, Crank and Connecting Rod, etc.
Fly-Wheels, Governors.
Balancing of Machinery.
Etc., etc.

STRENGTH OF THE PARTS OF MACHINES,

MACHINE DESIGN.

HYDRAULICS—

Discharge of Water through Orifices, Notches, etc. Flow in Pipes, and Open Channels. Water Power. Water Wheels, Turbines, Pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE.

Text Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
DuBois—Graphical Statics.
" Strains in Framed Structures.
Wood—Resistance of Materials.
" Bridges and Roofs.
Rankine—Applied Mechanics (*b*), (*c*).
Rankine—Steam Engine and other Prime Movers.
Unwin—Elements of Machine Design (*c*).
Shann—Elementary Treatise on Heat (*c*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Jackson—Hydraulic Manual (*c*).
Neville—Hydraulic Tables and Formulæ (*c*).

Fee for Special Students, $15.

(V.) PRINCIPLES OF MECHANISM.

Principles of the Transmission of Motion without reference to Force :—
Pitch Surfaces, Spur Wheels, Bevel Wheels, Skew-bevel Wheels, Trains of Wheelwork, Teeth of Wheels, Cams, Cranks, Eccentrics, Links, Bands and Pulleys, Hydraulic Connections, Frictional Gearing, Link Motion for Slide Valves, etc., etc.

Text Books and Books of Reference.—Rankine—Machinery and Millwork.
Camus—Teeth of Wheels.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*).

Fee for Special Students, $15.

The foregoing comprises the work to which the lectures and practical instruction will be principally confined. In addition, the Student will be required to obtain, by reading and observation during his course, a certain amount of information regarding the processes and details of Engineering Works, as below :—

(VI.) ENGINEERING WORKS.

Roads and Bridges.
Canals and Harbours.
Water and Sewage Works.
Workshop and Foundry Practice.
Mining Machinery and Processes.

Since information on these subjects is given in a plain and intelligible manner in the various treatises relating thereto, which can always be consulted by the Engineer when engaged in the actual practice of his profession, it has not been deemed expedient that much time should be given to them in the School.

(VII.) MATHEMATICS.

he Pure Mathematics included in this course will be taught in University College.

The Applied Mathematics will be taught partly in University College and partly in the School.

(VIII.) VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a Thesis (accompanied with drawings and specifications when necessary) during the subsequent vacation.

The student will also be required to make, during the vacation, full and clear notes of various constructions of engineering interest that may fall under his notice.

The value of both the Thesis and the construction notes will be taken into account in determining his standing at the next following examination.

CIVIL ENGINEERING.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.
Books of Reference.—Gilmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

MECHANICAL ENGINEERING.

Subject of Thesis for Second Year.—Machine-shop Practice.
" " *Third* " Foundry Practice.

Books of Reference.—

Any other works on the above subjects may be consulted, and results of original observation should be given.

II. CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES OF LECTURES.

I. Inorganic Chemistry.—A course on Elementary Inorganic Chemistry suited to the Pass Examination, University of Toronto ; to the Medical Examination, First Year, University of Toronto ; and to the Second Year, Engineering Course, School of Practical Science.

A Course on Elementary Chemistry for the First Year, Engineering Course.

A Course on Advanced Inorganic Chemistry for the Second Year, Honour Science Examination, University of Toronto.

A Course on the Theory of Qualitative Analysis for the Second Year, Honour Science Examination, University of Toronto.

II. Organic Chemistry.—A Course on Organic Chemistry for the Third Year, Honour Science Examination, University of Toronto.

A Course on Elementary Organic Chemistry, for the Medical Examination, Second Year, University of Toronto.

III. Historical Development of Chemical Theory.—A Course for the Fourth Year Examination in Science, University of Toronto.

IV. Physiological Chemistry.—A Course for the Fourth Year Examination in Science, University of Toronto.

V. Applied Chemistry.—A Course on the Chemistry of Combustion, Fuel, Furnace, Artificial Lighting and Explosives, Building Materials, Water, Air and Sewage, and on Metallurgy, suited to the Examination for Third Year, Engineering Course.

PRACTICAL WORK IN THE LABORATORY.

I. Courses including Qualitative Analysis, suited to the Examinations for
   (*a*) First Year, Engineering Course.
   (*b*) Second Year, Honour Science, University of Toronto.
   (*c*) First Year, Medicine, University of Toronto.

II. Courses including Quantitative and Qualitative Analysis for
   (*a*) Second Year, Engineering Course.
   (*b*) Third Year, Honour Science, University of Toronto.

III. Chemistry Applied to Medicine, for Second Year Examination in Medicine, University of Toronto.

IV. A Course for Fourth Year Examination in Science, University of Toronto.

III. MINERALOGY AND GEOLOGY.

COURSES OF LECTURES.

1. Elementary Course.—Rudiments of Mineralogy.
   Geology and Palæontology.
   Physical Geography.

Text Books and Books of Reference.—Chapman's Mineralogy and Geology of Canada, 3rd edition.
Dana's Manual of Mineralogy.
Dana's Text Book of Geology.
Page's Physical Geography.
Johnston's Elementary Physical Atlas.

2. Advanced Course.—Mineralogy and Crystallography.
Geology and Palæontology.
Mathematics of Crystallography.
Physical Geography.
Geology and Palæontology of Canada.

Text Books and Books of Reference.—Dana's System of Mineralogy.
Chapman's Geology of Canada.
Nicholson's Palæontology.
Chapman's Synopsis.

PRACTICAL COURSES.

1. Use of Blowpipe—Chapman's Blowpipe Practice.

2. Blowpipe Analysis, Determinative Mineralogy. Economic Minerals of Canada.

Kerl's Leitfaden bei qual. u. quant. Lothrohr-Untersuchungen, etc. Aufl. 2. Plattner's Blowpipe Treatise. Von Kobell's Tafeln. Chapman's Mineral Tables.

3. Assaying.—Mitchell's Assaying, by Crooks.
Kerl's Probirkunst.
Chapman's Assay Notes, 2nd edition.

4. Mining Geology.—*Books of Reference*—Burat's Géologie Appliquée and Cours d'Exploitation des Mines. Niederist's Bergbaukunde. Von Cotta's Erzlagerstatten.

IV. BIOLOGY.

Those students of the School of Practical Science who are required to take Biology as part of their course join the Arts Classes of the University of Toronto, which will be conducted henceforward in the New Building of the University Biological Department.

The following is the University Course in Biology for Art Students. That for Medical Students will be found in the Calendar of the Medical Faculty.

The following arrangements will be in force during the year 1889-90 :

1. A course of Elementary Lectures on Biology will be given on Tuesdays and Thursdays at 12 noon to prepare Candidates for the University Examination of the First Year.

2. A course of more advanced Lectures on Animal Physiology for Honor Students of the Second Year will be given three times a week at an hour to be arranged.

Text-Book—Yeo's Manual of Physiology.

3. Candidates for the Second Year Honor Examination in addition to attending the above Lectures will study Thomé's Lehrbuch der Zoologie as an introduction to the Zoology of the Vertebrata.

4. The Practical Course for Honor Students of the Second Year will be devoted to the methods of Biological Investigation, and to the study of typical forms of plants and animals, such as are treated of in Huxley and Martin's Elementary Practical Biology, new edition. Necessary Works of Reference will be found in the Laboratory. There will also be opportunities for the study of the Canadian Vertebrate Fauna (Text-book Jordan's American Vertebrates), and for a revision of the Canadian Flowering Plants, but the student is expected to have familiarized himself with the Canadian Flora during the preceding long vacation.

For Reference—Spotton's Canadian Flora or Gray's Manual.

5. Honor Students of the Third Year will study Cryptogamic Botany and Vegetable Physiology twice a week during the Michaelmas Term, and during the Easter Term the Zoology of the Invertebrata.

Books of Reference—1. Goebel's Outlines of the Classification of Plants.
2. Vines' Lectures on the Physiology of Plants.
3. Claus' Zoology, translated by Sedgwick.

6. The practical course for Third Year Students will be devoted to the study of typical forms of Cryptogamic Plants and Invertebrate Animals. In addition to the text-books referred to above Brook's Invertebrate Zoology will be required.

7. Wiedersheim-Parker's Elements of Comparative Anatomy of the Vertebrata, and Foster's Physiology, last English edition, are recommended for Honor Students of the Fourth Year, and the following works will be required in the Practical Course :

1. Klein's Elements of Histology.
2. Parker's Zootomy.
3. Foster and Balfour's Embryology.
4. Charles' Physiological Chemistry.

Works of reference on Bacteriology and the other subjects specified in the University Curriculum will be found in the Laboratory.

8. Students of all years are required to provide themselves with dissecting instruments, slides, cover-glasses, etc., and to pay a Laboratory fee for the use of microscopes and material for study.

V. MATHEMATICS AND PHYSICS.

The ordinary course embraces Euclid, Algebra, Plane Trigonometry, Statics of Solids and Fluids, Dynamics of a Particle, Geometrical Optics, Sound, Heat, Electricity, and Plane Astronomy.

The lectures in Physics will be fully illustrated by experiments.

The advanced course embraces Spherical Trigonometry, Analytical Geometry (Plane and Solid), Differential and Integral Calculus, Theory of Equations, Statics of Solids and Fluids, Particle and Rigid Dynamics, Hydrodynamics, Optics, Acoustics, Thermo-Dynamics, Electricity, and Astronomy.

VI. ETHNOLOGY.

Anthropology. The Skull, its bones and sutures. Structure and functions of the brain. Typical race-forms of head. Hair, color and other distinctive ethnical elements. Succession of races. The Prehistoric Unhistoric, and Historic races.

Physical evidences of diversity of race.

Philological evidence.

The lectures are illustrated by means of maps, drawings, specimens of typical skulls, primitive implements, etc.

Text-Books.—Tylor's Anthropology : an introduction to the study of Man and Civilization.
Brace's Manual of Ethnology.
Latham's Ethnology of British Isles.
" Ethnology of Europe.
" Man and his Migrations.
Max Müller's Science of Language, 1st Series.

Additional Books of Reference—Pritchard's Researches into the Physical History of Man.
Pritchard's Eastern Origin of the Celtic Language (Latham's Ed.)
Latham's Varieties of Man.
Neibuhr's Ethnography.
Wilson's Prehistoric Man (3rd Ed.)

PHYSICAL LABORATORY AND WORKSHOP.

The Physical Laboratory which has been lately established in connection with University College is furnished with a large collection of apparatus for lecture experiments in the departments of Mechanics, Sound, Light, Heat and Electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an Elementary Laboratory, there are several special Laboratories, which offer unusual facilities for the conduct of experiments in the various branches of Physics.

The electrical apparatus include Electrometers, Galvanometers, Resistance Coils and Bridges, Testing Keys, Batteries, Electrical Machines (Holz and Carré), Ruhmkorff Coils, Crooke's Tubes, Telephones, etc., etc.

The workshop contains a gas engine, lathes and other tools.

MODERN LANGUAGES.

Students in the regular courses are admitted, without extra charge, to the French and German classes in University College (see regulation 10). No special examinations are held in these languages, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, Etc.

The Library, Museums and Herbarium of the University of Toronto are open to regular students.

CALENDAR

OF THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and of the Regulations for Diplomas.

13th Session, 1890 - 91.

TORONTO:
PRINTED BY WARWICK & SONS 68 AND 70 FRONT STREET WEST.
1890.

1890.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

1. **FIRST TERM** begins Supplemental Examination begins.
10. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

14. Meeting of Council.

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

12. Meeting of Council.
23. **FIRST TERM** ends.

1891.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

8. **SECOND TERM** begins.
9. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

11. Ash Wednesday. Building closed.
13. Meeting of Council.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

13. Meeting of Council.
27. Good Friday. Building closed.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

8. Lectures and Practical Work Close.
10. Meeting of Council.
15. **Examinations begin.**

MAY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

1. **SECOND TERM** ends.

Faculty of the School.

J. GALBRAITH, M.A., Assoc. M. Inst. C.E., Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., Assoc. M. Inst. C.E. *Professor of Engineering* (*Chairman*)
W. H. ELLIS, M.A., M.B. ..... *Professor of Applied Chemistry.*
L. B. STEWART, P.L.S., D.T.S..... ..... *Lecturer in Surveying.* (*Secretary*)
C. H. C. WRIGHT, Grad. S.P.S..... *Lecturer in Architecture.*
T. R. ROSEBRUGH, B.A., Grad. S.P.S... *Demonstrator in Engineering. Laboratory.*

ASSISTANT INSTRUCTORS.

C. J. MARANI, Grad. S.P.S..... ..... *Fellow in Engineering.*
W. ROSS, B.A..... ..... *Fellow in Applied Chemistry.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

E. J. CHAPMAN, Ph.D., LL.D..... *Professor of Mineralogy and Geology.*
JAMES LOUDON, M.A..... ..... *Professor of Physics.*
R. RAMSAY WRIGHT, M.A., B.Sc..... *Professor of Biology.*
W. H. PIKE, M.A., Ph.D..... ..... *Professor of Chemistry.*
ALFRED BAKER, M.A..... *Professor of Mathematics.*
W. J. LOUDON, B.A..... *Demonstrator in Physics.*
A. B. MACALLUM, B.A., M.B., Ph.D.... *Lecturer in Physiology.*
J. McGOWAN, B.A..... ..... *Fellow in Mathematics.*
J. G. WITTON, B.A..... *Fellow in Physics.*
F. G. WAIT, B.A..... *Fellow in Mineralogy and Geology.*
J. J. McKENZIE, B.A..... *Fellow in Biology.*

For information further than that contained in the Calendar application may be made to the Secretary, L. B. STEWART.

Department of Engineering.

SESSION 1889-90.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

Civil Engineering.

1st Year.

Alison, J. H.
Anderson, A. G.
Brown, G. L.
Dickson, A. C.
Evans, J. W.
Fairchild, C.
Forester, C.
Francis, W. J.
Goodwin, J. B.
Jones, J. E.
Laschinger, E. J.
Laing, A. T.
Langley, C. E.
Marani, V. G. F.
Macallum, A.
McEntee, B.
McLennan, R.
Mitchell, C. H.
Paterson, J. F.
Prentice, J. M.
Rolph, H.
Ross, J. A.
Russell, R.
Smith, A.
Topp, C. H.
Watson, A.

2nd Year.

Allan, J. R.
Beatty, H. J.
Deacon, T. R.
Dill, C. W.
Dunbar, M.
Hill, V.
Lane, A.
McAllister, J. E.
Moore, J. E. A.
Newman, W.
Playfair, N. L.
Robinson, J. K.
Russel, W.
Sylvester, G. E.
Symmes, H. D.
Thompson R. W.

3rd Year.

Bowman, F. M.
Bucke, M. A.
Corrigan, G. D.
Duff, J. A., (B.A.)
English, A. B.
Garland, N. L.
Hutcheon, J.
Innes, W. L.
Meade, H.
Merrill, E. B.
Pedder,, J. R.
Peterson, C. E.
Wiggins, T. H.
Withrow, W. J.

Mechanical Engineering.

1st Year.

Cotton, W. H.
Goldie, A. R.
Hanly, J. B.
Lea, W. A.
Milne, C. G.
Robertson, C. G.
White, A. V.

3rd Year.

Ross, R. A.

SPECIAL STUDENTS.

Civil Engineering.

Russell, T. S.

Mechanical Engineering.

Lash, N. M. McCollum, H.

Surveying.

Fawcett, Adam.

Drawing.

Mickle, A. E. Harbert, W.

GRADUATES.

Note.—Graduates are requested to inform the Secretary of changes in their addresses.

1881.—J. L. Morris, C.E., P.L.S., Pembroke.

1882.—J. McAree, P.L.S., D.T.S., Toronto.
D. Jeffrey, Contractor, Winnipeg.
J. H. Kennedy, C.E., Architect, etc., St. Thomas, Ont.

1883.—G. H. Duggan, Dominion Bridge Co., Montreal.
J. W. Tyrrell, C.E., P. and D.L.S., Hamilton.
D. Burns, Surveyor's Office, Toronto.

1884.—E. W. Stern, Chicago Bridge and Iron Co., Chicago, Ill.
A. R. Raymer, Louisville & Nashville R. R., Cumberland Gap, Tenn.
J. Robertson, P.L.S., Coad & Robertson, Civil Engineers, P. L. Surveyors, etc., Glencoe, Ont.
W. C. Kirkland, Canadian Pacific Railway.
J. McDougall, B.A., Canadian Pacific Railway.

1885.—B. A. Ludgate, P.L.S., Peterborough, Ont.
O. McKay, P.L.S., Windsor.
E. E. Henderson, P.L.S., Canadian Pacific Railway, Brownville, Maine.
F. W. Bleakley, care of A. W. Keadie, Quincy, California.
H. J. Bowman, P. and D.L.S., Berlin, Ont.

1886.—T. K. Thomson, Bridge Engineer, N. & W. R. R. Ceredo, W. Va.
H. G. Tyrrell, Pencoyd Bridge and Construction Co., Penn.
R. Laird, P.L.S., Canadian Pacific Railway.
A. M. Bowman, P. and D.L.S., Lindsay, Ont.
E. B. Hermon, P. and D.L.S., Vancouver, British Columbia.

1887.—A. E. Lott, Atcheson, Topeka and Santa Fe Railway, Topeka, Kansas.
J. Roger, 544 Lafayette Ave., St. Paul, Minn.
J. C. Burns, Architect's Office, Toronto.
C. H. Pinhey, P. and D.L.S., 630 Wellington Street, Ottawa.
A. L. McCulloch, Galt.
F. Martin, Toronto.

1888.—J. F. Apsey, P.L.S., Toronto.
W. T. Ashbridge, City Engineer's Office, Toronto.
E. F. Ball, Niagara, Ont.
D. B. Brown, Cornwall, Ont.
C. M. Canniff, City Engineer's Office, Toronto.
H. J. Chewett, Engineer's Office, Toronto.
J. Gibbons, Renfrew, Ont.
R. McDowall, Owen Sound, Ont.
G. W. McFarlen, Surveyor's Office, Toronto.
C. J. Marani, Fellow in Engineering, S.P.S.
G. B. Mickle, B. A., Freiberg, Saxony.
J. H. Moore, Newmarket, Ont.
G. H. Richardson, Canadian Pacific Railway, Toronto.
K. Rose, Riverdale, California.
J. E. Ross, Beachburg, Ont.
C. H. C. Wright, Boston, Mass.

1889.—B. Carey, Engineer's Office, Toronto.
W. J. Chalmers, Mohawk, Ont.
W. A. Clement, Niagara, Ont.
G. F. Hanning, City Engineer's Office, Toronto.
H. E. T. Haultain, Manager St. Mauritius Mines, Barringen, Bohemia.
J. Irvine, Harriston, Ont.
D. D. James, Surveyor's Office, Toronto.
F. X. Mill, Engineer's Office, Brockville.
H. K. Moberly, Virginia, U. S.
T. R. Rosebrugh, B.A., Manufacturing Works, Paterson, New Jersey.
T. Wickett, Belleville.

FELLOWSHIP IN ENGINEERING.

A Fellowship of the value of $500 per annum, paid in eight monthly instalments, has been established, open only to Graduates in Engineering of the School.

The Fellow is required to take such portions of the work of instruction as may be assigned to him by the Professor of Engineering.

Candidates for the Fellowship are required to make written application to the Secretary on or before 20th September.

PRIZEMEN.

1879.—	I. Year	J. McAree	1st prize.
1880.—	II. Year	J. L. Morris	1st prize.
1881.—	I. Year	G. H. Duggan	1st prize.
	II. Year	D. Jeffrey	1st prize.
1882.—	I. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	II. Year	G. H. Duggan	1st prize.
	III. Year	D. Jeffrey	1st prize.
1883.—	I. Year	B. A. Ludgate	1st prize.
	" "	A. M. Bowman	2nd prize.
	II. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	III. Year	G. H. Duggan	1st prize.
1884.—	II. Year	B. A. Ludgate	1st prize.
	III. Year	E. W. Stern	1st prize.
	" "	A. R. Raymer	2nd prize.
1885.—	I. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
	II. Year	T. K. Thomson	1st prize.
	III. Year	B. A. Ludgate	1st prize.
1886.—	I. Year	C. H. C. Wright	1st prize.
	" "	J. E. Ross	2nd prize.
	II. Year	A. E. Lott	1st prize.
1887.—	I. Year	H. E. T. Haultain	1st prize.
	II. Year	C. H. C. Wright	1st prize.
	III. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
1888.—	I. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	II. Year	D. D. James	1st prize.
	III. Year	C. H. C. Wright	1st prize.
1889.—	I. Year	J. K. Robinson	1st prize.
	" "	G. E. Silvester	2nd prize.
	II. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prise.
	III. Year	D. D. James	1st prize.

DEGREE OF C. E.

Date of Admission.

1885.....J. L. Morris.
1886.....J. H. Kennedy.
1889.....J. W. Tyrrell.

Department of Analytical and Applied Chemistry.

Regular Students.

3rd Year.

Boustead, W.

2nd Year.

James, O. S.

1st Year.

Lawson, W.

Special Student.

Christie, R. J.

School of Practical Science.

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1890-91.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council, on the 3rd day of February, 1877.

By the scheme thus approved of, the government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order in Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted :

1. Civil Engineering (including Mining Engineering).
2. Mechanical Engineering (including Electrical Engineering).
3. Architecture.
4. Analytical and Applied Chemistry.
5. Assaying and Mining Geology.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also to give him such a training as will make him immediately useful when he enters into active professional work.

The facilities possessed by the School for affording professional instruction are now being largely increased by additions to the building, equipment and teaching staff. An Engineering Laboratory is being formed which will be furnished with testing machines for testing the strength, elasticity and other qualities of materials of construction, and also with an experimental steam plant, consisting of engine, boiler, pumps, etc., for making experiments in the economical use of steam. It will be supplied with all necessary standard gauges, scales and measuring instruments. There will be in connection with it a machine shop for the purpose of preparing specimens to be tested, making repairs, etc.

In Surveying, Geodesy and Practical Astronomy all the necessary instruments will be provided. Among the additions in this department will be a carefully laid out 100 feet standard of length.

The Architectural Department will be supplied with a large number of models, casts and photographs.

The appliances and apparatus necessary for teaching the applications of Chemistry to the arts and manufactures and for doing the chemical work in connection with the regular departments of instruction will also be greatly increased.

These additions and improvements are now in progress and it is expected that many of them will be sufficiently advanced to enable a large amount of new work to be done next session.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour the Lieutenant-Governor in Council the 19th day of March, 1890.

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1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be Chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma will be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments :—

(1) Civil Engineering (including Mining Engineering).
(2) Mechanical Engineering (including Electrical Engineering).
(3) Architecture.
(4) Analytical and Applied Chemistry.
(5) Assaying and Mining Geology.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. In order to obtain the Diploma of the School in one of the above Departments a candidate must have passed the Matriculation Examination required for admission to a University in any part of Her Majesty's Dominions, or the Entrance Examination of the Law Society of Upper Canada, or of the College of Physicians and

Surgeons, or of the Royal Military College at Kingston, or of any of the Examinations prescribed for Teachers in Public or High Schools of the Province of Ontario, or must present a certificate signed by a Head Master of a High School or Collegiate Institute, or by the Principal of Upper Canada College, or the Head Master of Trinity College School, Port Hope, that he possesses qualifications equivalent to those required for such teachers.

6. Special Students may be permitted to attend such lectures or courses of instruction or of practical work, as the Council may think proper.

7. Certificates of attendance and standing may be given upon due examination to Special Students, and such students shall not be required to pass an Entrance Examination.

8. At the end of the Academic year, examinations will be held in the different subjects taught, and prizes will be awarded for excellence in each Department. Candidates for Diplomas and Certificates are required to enter for these.

9. All Regular Students shall be in attendance at the School during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

10. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry and Surveying, the following minimum number of drawings must be made in the respective years :

Civil Engineering.	No. of Drawings.	Mechanical Engineering.	No. of Drawings.
I Year.—Applied Mechanics....	8	.....	13
Descriptive Geometry.	6	.....	10
Surveying	9		
II Year.—Applied Mechanics....	7	.....	11
Descriptive Geometry.	12	.....	12
Surveying	4		
III Year.—Applied Mechanics....	8	.....	12
Descriptive Geometry.	11	.....	11
Surveying	4		

The above minimum number of drawings will include only such drawings as shall be specially prescribed for the purpose.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned minimum number of drawings must be made, together with as many practice sheets as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The marks allotted to the above-mentioned minimum number of drawings form two-thirds of the total marks allotted in this subject.

The drawings must be made on paper 15 x 22 inches, unless otherwise prescribed.

The Council reserves the right of disposing of the drawings as they may think proper. No drawing may be removed from the school without permission.

No drawings will be counted which have not been made in the drafting rooms and during the hours allotted to such work.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No field notes will be counted which have not been taken in the field and during the hours allotted to such work.

Vacation Work must be handed in during the first week of the ensuing session, otherwise it will not be counted.

Vacation notes must be on construction only and consist of not less than 20 nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap and consist of not less than 20 nor more than 30 pages.

The minimum percentage of marks required for practical work will be required in the case of vacation notes and theses.

No notes whatever, whether made during the session or the vacation, will be counted unless made in the standard note books of the School.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the *written* examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations will begin on the first day of the session.

In the case were a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between nine a.m. and five p.m. in the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted unless under such exceptional circumstances as may be deemed sufficient by the Council, and which must be fully set forth in a formal petition.

Prizes.

Two prizes are open for competition in each year ; the first prize of the value of $10.00, the second of $5.00.

These will be awarded to the students who stand first and second in general proficiency in the subjects of the year, under the following conditions, viz. :—

The candidate must have passed in each subject and have obtained at least 75 per cent. of the total number of marks allotted to the subjects.

REGULAR EXAMINATIONS.

The following is an approximate list of the examinations to be held and of their relative values in the competition for prizes :—

Departments of Civil and Mechanical Engineering (1 and 2).

I. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Algebra.	100....	Statics.
100....	Euclid.	100....	Dynamics.
100....	Plane Trigonometry.	100 ...	Descriptive Geometry.
100....	Analytical Geometry.	100....	Surveying.
		100....	Chemistry, Elementary.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....	*Field Notes.
30.....	Construction Notes.
100.....	†Experimental Physics.
100.....	Practical Chemistry.

*Civil Engineering only. †Mechanical Engineering only.

II. Year.

Examinations held at end of Session.

Value.	Subject.
100....	Calculus.
100....	*Astronomy.
100....	Optics.
100....	Hydrostatics.
100....	†Magnetism & Electricity.
100....	Strength of Materials.
100....	Rigid Dynamics.
100....	†Theory of Mechanism.
100....	Descriptive Geometry.
100....	*Surveying.
100....	Spherical Trigonometry & Geodesy.
100....	Chemistry, Applied.
100....	*Mineralogy and Geology.
100....	*Mineralogy, Practical.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....	*Field Notes.
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).
100.....	Chemistry, Practical.

III. Year.

Examinations held at end of Session.

Value.	Subject.
100....	Method of Least Squares.
100....	†Magnetism and Electricity.
100....	Theory of Compound Stress.
100....	*Theory of Construction.
100....	†Mechanics of Machinery.
100....	†Machine Design.
100....	Hydraulics.
100....	Thermodynamics.
100....	Descriptive Geometry.
100....	*Practical Astronomy and Geodesy.
100....	*Surveying and Levelling.
100....	Chemistry, Applied.
100....	*Mineralogy and Geology.
100 ...	*Mineralogy, Practical.

*Civil Engineering only. †Mechanical Engineering only.

Examinations held during the Session.

Value.	Subjects.
300.....	Drawings.
100.....	*Field Notes.
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).

*Civil Engineering only. †Mechanical Engineering only.

NOTE.—Lists of the examinations in departments 3, 4 and 5 will be issued before the end of next session.

REGULAR COURSES FOR THE DIPLOMA.

See regulations 2, 3, 4, 5, 8, 9, 10 : pp. 11 and 12.

The fees (payable through the Principal to the Provincial Treasurer) for instruction in any of the Departments, are as follows :

First Session : Thirty-four Dollars.

Second Session : Forty-four Dollars.

Third Session : Fifty-four Dollars.

These are payable in two equal instalments, one in each term. A discount of two dollars will be made on each instalment if paid before the end of the first month of the term in which it is due. There is no extra fee for Diploma.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Mining Engineering).
(2) Mechanical Engineering (including Electrical Engineering).
(3) Architecture.
(4) Analytical and Applied Chemistry.
(5) Assaying and Mining Geology.

FORM OF DIPLOMA

THE

School of Practical Science,

PROVINCE OF ONTARIO.

(Established 1878.)

THIS IS TO CERTIFY *that*

.....

of the.....*in the*.....

..... *has completed the Regular Course of this School for the Diploma in the*.....

extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz. :

.....

.....

.....

Wherefore *the said* ..... *becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.*

In witness *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

.....*One thousand eight hundred and*.....

and have caused the seal of this School to be hereunto affixed.

.....*Chairman.*

[L. S.]

.....*Secretary.*

ESTIMATED EXPENSES IN THE DEPARTMENT OF ENGINEERING.

NOTE.—Each Student is required to furnish himself with the following drawing instruments and materials, viz. :—

One drawing-board, 23″ × 31″; 1 T square, 31 inch : 2 set squares, 60° and 45°, not less than 6″ on the side ; 1 6″ (or larger) protractor ; 1 12″ triangular scale, containing 10, 20, 30, 40, 50 and 60 chain scales ; 1 12″ triangular scale, containing $\frac{1}{16}$, $\frac{1}{8}$; $\frac{1}{4}$, $\frac{1}{2}$; 1, 2 ; $\frac{3}{8}$, $\frac{3}{4}$; $1\frac{1}{2}$, 3 ; $\frac{1}{5}$, $\frac{1}{10}$ open divided scales ; 1 drawing pen ; 1 pair dividers : 1 pair compasses with ink and pencil points, lengthening bar, etc. ; 1 set spring bows, crow-quill pens, French curves. 1 2ft. pocket rule, Arkansas oil stone, thumb-tacks. paper, tracing vellum, pencils, rubber, colors, sponge, brushes, nest of saucers, water mug, etc., and one portfolio for drawings.

The expenses for the Regular Course in the Department of Engineering are approximately as follows :—

Sessional Fees	$120 00
Books, instruments, drawing materials, laboratory, fees, etc.	120 00
Total	$240 00

These expenses are divided equally between the three sessions.

Each student in this department is required to deposit $1 per annum for the purpose of covering breakages and losses occurring to apparatus and furniture.

Making this deposit will, however, not free any student from the liability to make good any loss or damage to instruments or furniture, arising from want of proper care on his part, when the above fund may prove insufficient for the purpose.

DEPARTMENT OF

TIME TABLE OF REGULAR

Instruction will be given during the Session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Elementary Chemistry.	Drawing.
10-11	Elementary Chemistry.	Drawing.
11-12	*Geometry	Drawing.
12-1	Statics.	Descriptive Geometry.
1-2		Surveying (lecture).
2-3	Drawing.	Surveying (lecture).
3-4	Drawing.	Field Work.
4-5	Drawing.	Field Work.

SECOND YEAR.

9-10	Strength of Materials.	*Astronomy.
10-11	*Physics (Hydrostatics and Optics).	*Physics (Hydrostatics and Optics).
11-12	Drawing.	Chemistry.
12-1	Drawing.	Drawing.
1-2		
2-3	*Experimental Physics.	Applied Chemistry.
3-4	*Experimental Physics.	Field Work.
4-5	El. Mineralogy & Geology.	Field Work.

THIRD YEAR.

9-10	Drawing.	Applied Chemistry.
10-11	Drawing.	Astronomy and Geodesy.
11-12	Theory of Compound Stress	Constructive Design.
12-1	Drawing.	Mineralogy.
1-2	Mineralogy (*b*)	
2-3	Constructive Design.	Thermo-dynamics.
3-4	Drawing.	Field Work.
4-5	Drawing.	Field Work.

* In the University of Toronto.

Additional lectures are given at hours not specified in above time-table and when the weather will not permit of field work.

ENGINEERING.

COURSE IN CIVIL ENGINEERING.

1890-91, according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Drawing.	Drawing.	Drawing.
Statics.	*Conics.	*Algebra & Trigonometry. Dynamics (*b*).
Elementary Chemistry.	*Trigonometry. Field Work.	*Trigonometry. Field Work.

SECOND YEAR.

Strength of Materials. *Calculus. Practical Chemistry.	*Astronomy. Descriptive Geometry. *Physics (Hydrostatics and Optics). Spherical Trigonometry.	*Calculus. *Physics (Hydrostatics and Optics. Practical Chemistry.
Rigid Dynamics. Drawing. El. Mineralogy & Geology.	Applied Chemistry. Practical Mineralogy (*b*). Field Work (*a*).	Theory of Surveying Instruments. Field Work.

THIRD YEAR.

Drawing. Hydraulics (*b*). Descriptive Geometry. Drawing. Mineralogy (*b*). Drawing.	Drawing. Practical Mineralogy. Thermo-dynamics. Field Work.	Applied Chemistry. Astronomy & Geodesy. Constructive Design (*a*), Hydraulics (*b*). Drawing. Experimental Physics (*b*) Field Work (*a*).

(*a*) During First Term. (*b*) During Second Term.

This time-table is subject to modification, when necessary, to prevent conflict of hours.

DEPARTMENT OF

TIME TABLE OF REGULAR COURSE

Instruction will be given during the Session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Elementary Chemistry.	Drawing.
10-11		
11-12	*Geometry.	
12-1	Statics.	Descriptive Geometry.
1-2		Surveying (lecture).
2-3	Drawing.	
3-4	*Experimental Physics(b)	Drawing.
4-5		*Experimental Physics(b

SECOND YEAR.

9-10	Strength of Materials.	Drawing.
10-11	*Physics.	*Physics.
11-12	Drawing.	Chemistry.
12-1		Drawing.
1-2		
2-3		Applied Chemistry.
3-4	Drawing.	Drawing.
4-5		

THIRD YEAR.

9-10	Drawing.	Applied Chemistry.
10-11		Machine Design.
11-12	Theory of Compound Stress	Drawing.
12-1	Drawing.	
1-2		
2-3		Thermo-dynamics.
3-4	*Experimental Physics.	Drawing.
4-5		

* In the University of Toronto.

This time-table is subject to modification, when necessary, to prevent conflict of hours.

ENGINEERING.

IN MECHANICAL ENGINEERING.

1890-91, according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Drawing.	Drawing.	Drawing.
Statics.	*Conics.	*Algebra & Trigonometry. Dynamics (*b*).
Elementary Chemistry.	*Trigonometry. Drawing.	*Trigonometry. Drawing. *ExperimentalPhysics(*b*)

SECOND YEAR.

Strength of Materials. *Calculus. Practical Chemistry.	Theory of Mechanism. Descriptive Geometry. *Physics. Spherical Trigonometry.	*Calculus. *Physics. Practical Chemistry.
Rigid Dynamics. Drawing.	Applied Chemistry. Drawing.	Theory of Mechanism. Drawing. *Experimental Physics.

THIRD YEAR.

Drawing. Hydraulics (*b*). Descriptive Geometry. Drawing.	Drawing. Mechanics of Machinery. Drawing.	Applied Chemistry. Machine Design. Hydraulics (*b*). Drawing.
*Experimental Physics.	Thermo-dynamics. Drawing.	*Experimental Physics.

(*b*) During Second Term.

I. DEPARTMENT OF CIVIL ENGINEERING.

(Including Mining Engineering).

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Mining Engineers).

Students who wish to devote themselves to the practice of Mining Engineering are allowed to take the work specially mentioned under this head, in the Third Year, and to omit the work in Experimental Physics.

They are advised, however, to take, if possible, the regular course in Civil Engineering and the special work subsequently as Special Students.

Subjects for the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry, Analytical Plane Geometry

Mechanics.

Statics and Dynamics (with special reference to Structures and Machines).

Drawing.

Copying from the flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids. Orthographic (including Isometric) and Oblique Projection.

Surveying.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary Instruction in use of the transit and Theodolite—Plotting, Mensuration.

Chemistry.

Elementary Chemistry, with Laboratory Practice.

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

EXPERIMENTAL PHYSICS.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Telescope and Microscope, and Reflecting instruments.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and Structures. (Drawings made from both copies and original notes.)

ENGINEERING AND SURVEYING.

Theodolite Surveying (including laying out Railway Curves).
Principles of Geodesy (considering the Earth a Sphere).
Statics and Dynamics. (Pure and applied.)
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.
Theory of the Theodolite, Transit-Theodolite, Level, and Sextant.

CHEMISTRY.

General Chemistry.
Practical Chemistry.
Chemistry (Applied).
Combustion, Fuel, and Furnaces.
Metallurgy of Iron and Steel.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

SUBJECTS OF THE THIRD YEAR.

EXPERIMENTAL PHYSICS.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry. Principle of Least Squares.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

ENGINEERING AND SURVEYING.

Subjects of previous years continued.
Levelling. Setting out Excavation, Cross-sectioning, Calculation of Quantities.
Applied Mechanics.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.
Application of Principles to practical problems connected with the design and construction of various Structures and Machines, *e. g.*, Foundations, Retaining Walls, Arches, Roofs, Bridges, Roads, Railways, Canals, Sewers, Water Wheels, Steam Engines, Hydraulic Machinery, Mining Machinery, etc.
Practical Astronomy.
Geodesy (Considering the Earth a Spheroid).

CHEMISTRY (APPLIED).

Artificial Lighting.
Photography.
Explosives.
Mortars and Cements.
Bricks and Artificial Stones.
Preservation of Wood, Iron and Stone.
Water, Air and Sewage.
*Metallurgy, with special reference to Copper, Lead, Silver and Gold.

MINERALOGY AND GEOLOGY.

Economic Minerals of Ontario.
Blowpipe Analysis and Determinative Mineralogy.
*Assaying and Mining Geology, Mining Calculations.
*Crystallography and Palæontology.

An option will be allowed between Thermodynamics and advanced Practical Astronomy and Geodesy.

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*Mining Engineering only.

II. DEPARTMENT OF MECHANICAL ENGINEERING.

(Including Electrical Engineering).

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical Engineers (including under this term Electrical Engineers.)

Subjects of the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

Mechanics.

Statics and Dynamics (with special reference to Structures and Machines).

Experimental Physics.

Light: Use of the Heliostat and Spectroscope.
Experiments with Lenses and Mirrors.
Theory of the Microscope and Reflecting Instruments.

Drawing.

Copying from the Flat, Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

Chemistry.

Elementary Chemistry with Laboratory Practice.

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Physics.

Hydrostatics.
Optics.
Magnetism.
Electricity.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry.
Principle of Least Squares.

Drawing.

Subjects of first year continued.
Coloring and Shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and Structures. (Drawings made from both copies and original notes.)

Engineering.

Statics and Dynamics (Pure and Applied).
Theory of Mechanism.
Theory of Strength of Materials.
Materials of Construction.
Methods and Processes.

Chemistry.

Theoretical Chemistry.
Practical do
Applied do
Combustion, Fuel and Furnaces.
Metallurgy of Iron and Steel.
Laboratory Practice.

Subjects of Third Year.

Experimental Physics.

Acoustics.
Electrical Measurements and Testing.

Drawing.

Subjects of previous years continued.
Descriptive Geometry:
Shades and Shadows.
Stone cutting.
Perspective Projection.

Original Designs.

Engines, Water Wheels, Shafting, Belting and Gearing, Machines, etc.

ENGINEERING.

Subjects of previous years continued.
Applied Mechanics:
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.
Application of Principles to Practical Problems connected with the design, construction and testing of various Prime Motors and Machines.

CHEMISTRY (APPLIED).

Artificial Lighting.
Photography.
Explosives.
Preservation of Wood, Iron and Stone.
Metallurgy.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam-engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

III. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

1 YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

MECHANICS.

Statics (with reference to Structures).
Dynamics (preliminary to the study of Hydraulics).

DRAWING.

Instrumental and Free-hand, Copying from the Flat, Lettering.
Descriptive Geometry, (Plane Surfaces).

HISTORY OF ARCHITECTURE.

ORDERS AND ELEMENTS OF ARCHITECTURE.

SURVEYING.

Principles, Chain Surveying, Mensuration.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

II YEAR.

MATHEMATICS.

Differential and Integral Calculus.

PHYSICS.

Hydrostatics.
Optics.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching and Water Color.
Descriptive Geometry, (Curved Surfaces).

SURVEYING.

Use of Transit and Level,
Mensuration.

MECHANICS.

Statics Pure and Applied.
Theory of Strength and Elasticity of Materials.
Materials of Construction.

HISTORY OF ARCHITECTURE.

HISTORY OF ORNAMENT.

PRINCIPLES OF DECORATION.

CHEMISTRY.

General Chemistry.
Practical do
Applied do
Combustion, Fuels and Furnaces.
Metallurgy, Iron and Steel.

MINERALOGY AND GEOLOGY.

Elements.

III YEAR.

DRAWING.

Descriptive Geometry.
Shades and Shadows.
Perspective.
Stone Cutting.
Water Color Sketching.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

PHYSICS.

Acoustics, Electricity, Heat.

HISTORY OF ARCHITECTURE.

HISTORY OF ORNAMENT.

DECORATION.

SPECIFICATIONS.

CHEMISTRY (APPLIED).

Artificial Lighting, Photography, Mortars and Cements, Bricks, and Artifical Stone.
Preservation of Wood, Iron and Steel.
Water, Air, and Sewage.

THEORY OF CONSTRUCTION.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.

MINERALOGY AND GEOLOGY.

Economic Minerals of Ontario.

A time table will be arranged at the beginning of next term.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and the Survey of Lands.

12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study, of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service; or, in case he has only received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with the land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavid required by the next preceding clause as to such service ; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause,

The fee for special students in Surveying is $30 per session.

The attention of Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884 :—

DEGREE OF C. E.

By the Senate of the University of Toronto.

Be it enacted:

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C.E. be hereby established, to be granted subject to the following conditions and regulations :—

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.

5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.

6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates ; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.

7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate, not later than the first day of February.

8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.

9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.

10. The examination of the essay, drawings and estimates and any further examination of the candidate that may be considered necessary, may be held in May.

11. The fee for the degree of C.E. shall be $20, and shall be paid to the Registrar not later than the first day of May.

12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.

IV. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is under the charge of the Professor of Applied Chemistry.

The regular course is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists, industrial chemists, or teachers, and also to furnish instruction in chemistry and its useful applications, to students of engineering and architecture, and to special students who may desire such instruction.

Honor graduates in Natural Science of the University of Toronto will be admitted to the examination for the Diploma after taking a course of one year in the School of Science in such of the following subjects as may be determined by the Council.

Subjects of the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

Mechanics.

Statics and Dynamics.

Experimental Physics.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Microscope and Reflecting Instruments.

Drawing.

Descriptive Geometry.

Biology.

Modern Languages.

French.
German.

Chemistry.

Inorganic Chemistry with Laboratory work.

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Physics.

Hydrostatics.
Optics.
Magnetism.
Electricity.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer. Thermometry and Calorimetry. Principle of Least Squares.

Modern Languages.

French.
German.

Mineralogy and Geology.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

Chemistry.

Organic Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

Subjects of the Third Year.

Physics.

Thermodynamics.
Electricity.
Laboratory work.

Physiology.

Mineralogy and Geology.

Chemistry.

Inorganic Chemistry, including Thermo-Chemistry; the Study of Mendelejeff's Periodic Law.
Advanced Organic Chemistry.
Historical Development of Chemical Theory.
Physiological Chemistry.
Applied Chemistry.
Laboratory work.

Students in the Third Year may select either of the following courses :

(*a*) Industrial Chemistry,

Physics, Chemistry Pure and Applied, with Laboratory work in General and Technical Analysis.

(*b*) Metallurgy.

Including Mineralogy and Geology, Chemistry Pure and Applied with Laboratory work in Mineral Analysis and Assaying.

(*c*) Sanitary Chemistry.

Including Physiology and Bacteriology, Chemistry Pure and Applied, with Laboratory work in Toxicology, and the Analysis of Food, Water and Air.

V. DEPARTMENT OF ASSAYING AND MINING GEOLOGY.

In this Department the student is fully prepared in all the methods of analysis necessary to render him a competent Assayer. He is also qualified to survey and report upon the value of mineral lands.

Subjects of First Year :

1. Elementary Mathematics, including Mensuration and Plane Trigonometry.
2. Elements of Natural Philosophy, including Mechanics and Hydraulics.
3. Inorganic Chemistry.
4. Elementary Mineralogy and Blowpipe Practice.
5. Elementary Biology.
6. Physical Geography, Palæontology and Geology.
7. Drawing.

Subjects of Second Year :

1. Higher Mathematics, including Spherical Trigonometry, etc.
2. Chemistry, with Laboratory practice in Qualitative Analysis.
3. Blowpipe Analysis and Determinative Mineralogy.
4. Geology and Economic Minerals of Canada.
5. Surveying and Levelling.

Subjects of Third Year :

1. Quantitative Chemical Analysis.
2. Metallurgy.
3. Assaying.
4. Study of Metallic Veins and other Mineral Deposits, Mining Calculations, Examinations of Mineral Lands.

Synopsis of the Courses of Lectures

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT,

With Fees for Special Students.

The same discounts for prompt payment will be allowed as in the case of Regular Students. *See p. 17.*

Special Students are advised to enter at the beginning of the Session (October 1st), as many subjects begun in the First Term are continued through the Second, and Lectures cannot be repeated.

I. CIVIL ENGINEERING; II. MECHANICAL ENGINEERING; III. ARCHITECTURE.

(Reductions will be made to Special Students taking several courses.)

☞Text-books for the First Year marked (*a*); for Second Year, (*b*); for Third Year, (*c*).

(I.) DRAWING.

Model Drawing, Machines aad Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-books and Books of Reference.—Davidson's Projections.
Angel's Plane and Solid Geometry.
Binn's Orthographic Projection.
Church's Descriptive Geometry, (*a*), (*b*), (*c*).
Warren's Stone Cutting (*c*).
McCord's Lessons in Mechanical Drawing.
Worthen's Topographical Drawing (*a*), (*b*), (*c*).

Fees for Special Students, $14.

(II.) SURVEYING AND LEVELLING.

LAND SURVEYING—

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING—

Longitudinal and Cross sections.
Plotting.

SETTING OUT—

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION—

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*).
Henck's or Trautwine's Railway Curves (*b*).

Fees for Special Students, $14.

(III.) PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE—

The work included in this course is sufficient to fulfil the requirements of the final examinations for Provincial and Dominion Land Surveyors.

In Astronomy the principle subjects are the determination of Time, Latitude and Azimuth, and the general principles of the methods of determining Longitudes. Practical instruction is given in the methods of taking observations.

In Geodesy all Surveys, Computations and Methods of Map Construction are based upon the supposition that the earth is a Sphere.

ADVANCED COURSE—

The work in this course is intended to fulfil the requirements of the final examination for Dominion Topographical Surveyors. It is distinguished from the work in the Ordinary Course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In Geodesy the earth is considered as a Spheroid.

Text Books.—Gillespie's Higher Surveying (*b*), (c).
Chauvenet's Spherical and Practical Astronomy (*c*).
Gore's Elements of Geodesy (*c*).
Nautical Almanac, 1891, (*c*).

Fee for Special Students, $19.

(IV.) APPLIED MECHANICS.

STATICS—

The Calculation of the Stresses in Framed Structures, Solid and Rivetted Beams, Stone Arches, etc. Both Graphical and Analytical Methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS—

DESIGNING OF STRUCTURES in Timber, Iron and Masonry—Arches, Retaining Walls, Foundations, Roofs, Bridges, etc.

DYNAMICS—

Representation and Measurement of Forces and Motions.
Principles of *Work* and *Energy*.
Efficiency of Machines. Friction.
Transmission of Energy—Belts, Shafts, Crank and Connecting Rod, etc.
Fly-Wheels, Governors.
Balancing of Machinery.
Etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS—

Discharge of Water through Orifices, Notches, etc. Flow in Pipes and Open Channels. Water Power. Water Wheels, Turbines, Pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE.

Text Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
DuBois—Graphic Statics.
" Strains in Framed Structures.
Cotterill—Applied Mechanics (*a*), (*b*) (*c*).
Rankine—Applied Mechanics (*b*), (*c*).
" Steam Engine and other Prime Movers.
Unwin—Elements of Machine Design (*c*).
Shann—Elementary Treatise on Heat (*c*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Merriman—Hydraulics.
Jackson—Hydraulic Manual.
Neville—Hydraulic Tables and Formulæ (*c*).

Fees for Special Students, $19.

(V.) PRINCIPLES OF MECHANISM.

Principles of the Transmission of Motion without reference to Force :—
Pitch Surfaces, Spur Wheels, Bevel Wheels, Skew-bevel Wheels, Trains of Wheelwork, Teeth of Wheels, Cams, Cranks, Eccentrics, Links, Bands and Pulleys, Hydraulic Connections, Frictional Gearing, Link Motion for Slide Valves, etc., etc.

Text Books and Books of Reference.—Rankine—Machinery and Millwork.
Camus—Teeth of Wheels.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*).
Cotterill—Applied Mechanics (*b*).

Fee for Special Students, $19.

The foregoing comprises the work to which the lectures and practical instruction will be principally confined. In addition, the student will be required to obtain, by reading and observation during his course, a certain amount of information regarding the processes and details of Engineering Works, as below :—

(VI.) ENGINEERING WORKS.

Roads and Bridges.
Canals and Harbours.
Water and Sewage Works.
Workshop and Foundry Practice.
Mining Machinery and Processes.

Since information on these subjects is given in a plain and intelligible manner in the various treaties relating thereto, which can always be consulted by the Engineer when engaged in the actual practice of his profession, it has not been deemed expedient that much time should be given to them in the School.

(VII.) MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the School.

(VIII.) VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a Thesis (accompanied with drawings and specifications when necessary) during the subsequent vacation.

The student will also be required to make, during the vacation, full and clear notes of various constructions of engineering interest that may fall under his notice.

The value of both the Thesis and the construction notes will be taken into account in determining his standing at the next following examination.

CIVIL ENGINEERING.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.
Books of Reference.—Gilmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

MECHANICAL ENGINEERING.

Subject of Thesis for Second Year.—Machine-shop Practice.
" " *Third* " Foundry Practice.
Books of Reference.—

Any other works on the above subjects may be consulted, and results of original observation should be given.

IV. CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

Courses by the Professor of Chemistry of the University of Toronto—

Inorganic Chemistry.
Organic Chemistry.
Historical Development of Chemical Theory.
Physiological Chemistry.
Qualitative and Quantitative Analysis.

Courses by the Professor of Applied Chemistry in the School of Practical Science—

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuel, Furnaces, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air and Sewage, Metallurgy, Chemical Manufactures.
Laboratory Work, including Technical Analysis.

V. MINERALOGY AND GEOLOGY.

COURSES OF LECTURES.

1. Elementary Course.—Rudiments of Mineralogy.
Geology and Palæontology.
Physical Geography.

Text Books and Books of Reference.—Chapman's Mineralogy and Geology of Canada, 3rd edition.
Dana's Manual of Mineralogy.
Dana's Text Book of Geology.
Page's Physical Geography.
Johnston's Elementary Physical Atlas.

2. Advanced Course. —Mineralogy and Crystallography.
Geology and Palæontology.
Mathematics and Crystallography.
Physical Geography.
Geology and Palæontology of Canada.

Text Books and Books of Reference.—Dana's System of Mineralogy.
Chapman's Geology of Canada.
Nicholson's Palæontology.
Chapman's Synopsis.

PRACTICAL COURSES.

1. Use of Blowpipe—Chapman's Blowpipe Practice.

2. Blowpipe Analysis, Determinative Mineralogy. Economic Minerals of Canada.

Kerl's Leitfaden bei qual. u. quant. Lothrohr-Untersuchungen, etc., Aufl. 2. Plattner's Blowpipe Treatise. Von Kobell's Tafeln. Chapman's Mineral Tables.

3. Assaying.—Mitchell's Assaying, by Crooks.
Kerl's Probirkunst.
Chapman's Assay Notes, 2nd edition.

4. Mining Geology.—*Books of Reference*—Burat's Géologie Appliquée and Cours d'Exploitation des Mines. Niederist's Bergbaukunde. Von Cotta's Erzlagerstatten

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PHYSICAL LABORATORY AND WORKSHOP.

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of Mechanics, Sound, Light, Heat and Electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an Elementary Laboratory, there are several special Laboratories, which offer unusual facilities for the conduct of experiments in the various branches of Physics.

The electrical apparatus includes Electrometers, Galvanometers, Resistance Coils and Bridges, Testing Keys, Batteries, Electrical Machines (Holz and Carré), Ruhmkorff Coils, Crooke's Tubes, Telephones, etc., etc.

The workshop contains a gas engine, lathes and other tools.

MODERN LANGUAGES.

Students in the regular courses are admitted, without extra charge, to the French and German classes in University College (see regulation 10). No special examinations are held in these languages, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, Etc.

The Library, Museums and Herbarium of the University of Toronto, are open to regular students.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

OFFICERS FOR 1889-90.

President.....J. A. DUFF, B.A.
Vice-President.....E. B. MERRILL.
Secretary-Treasurer.....T. R. DEACON.
Corresponding Secretary.....F. M. BOWMAN.
Librarian.....T. S. RUSSELL.
Representatives—Graduates'.....C. J. MARANI.
Third Year.....J. R. PEDDER.
Second Year.....M. DUNBAR.
First Year.....C. H. MITCHELL.
Special Students.....J. B. HANLY.

The Society meets every second Tuesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually containing the best papers read before the Society.

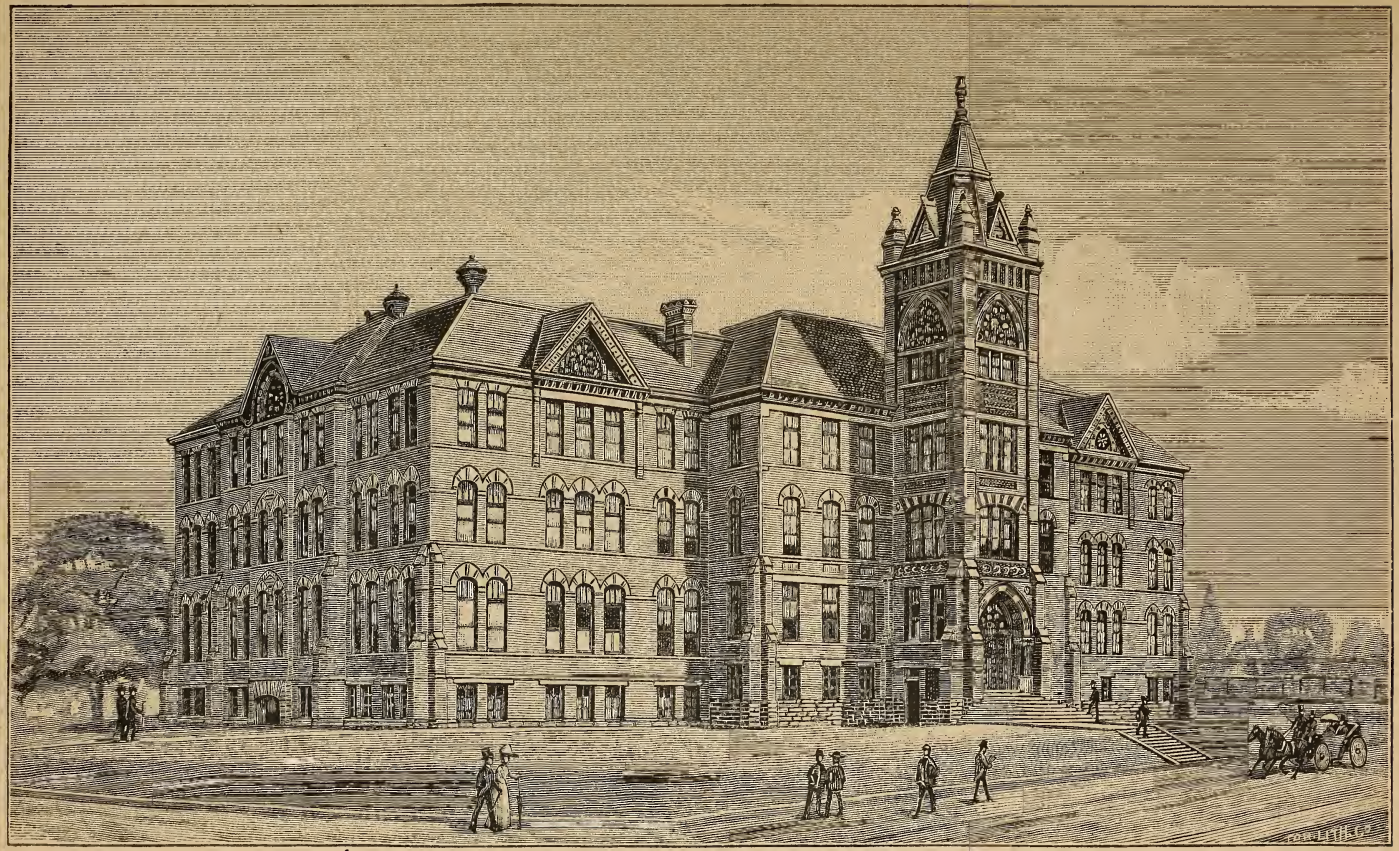
Membership fee, $1 per annum.

ATHLETIC ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

OFFICERS FOR 1890.

Honorary President.....PROF. GALBRAITH.
President.....H. D. SYMMES.
Vice-President.....M. DUNBAR.
Secretary-Treasurer.....A. F. MACALLUM.
Curator.....(not yet appointed.)
Committee, 3rd year.....C. W. DILL.
2nd year.....C. E. LANGLEY.
1st year.....———

This association has the supervision of the football, hockey and athletic sports in general.



Ontario School of Practical Science, Toronto.

CALENDAR

OF THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and of the Regulations for Diplomas.

14th Session, 1891-92.

TORONTO:
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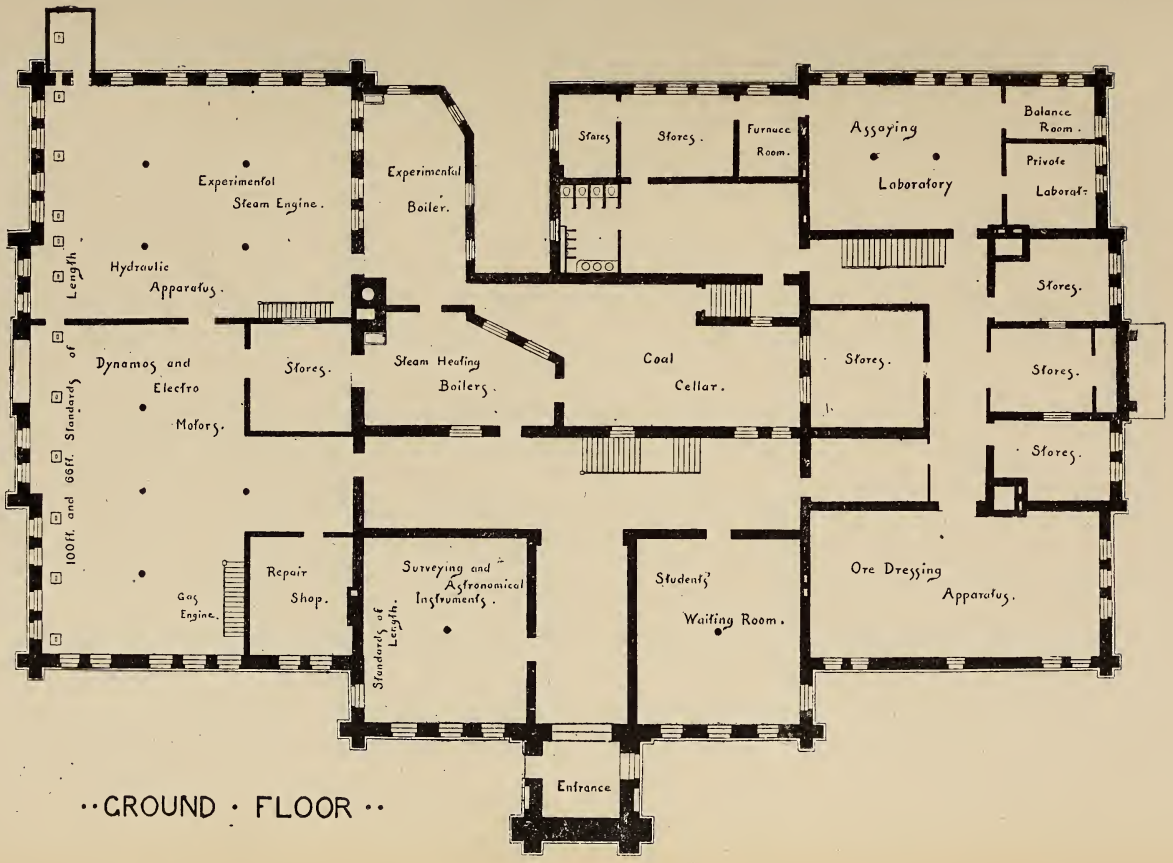
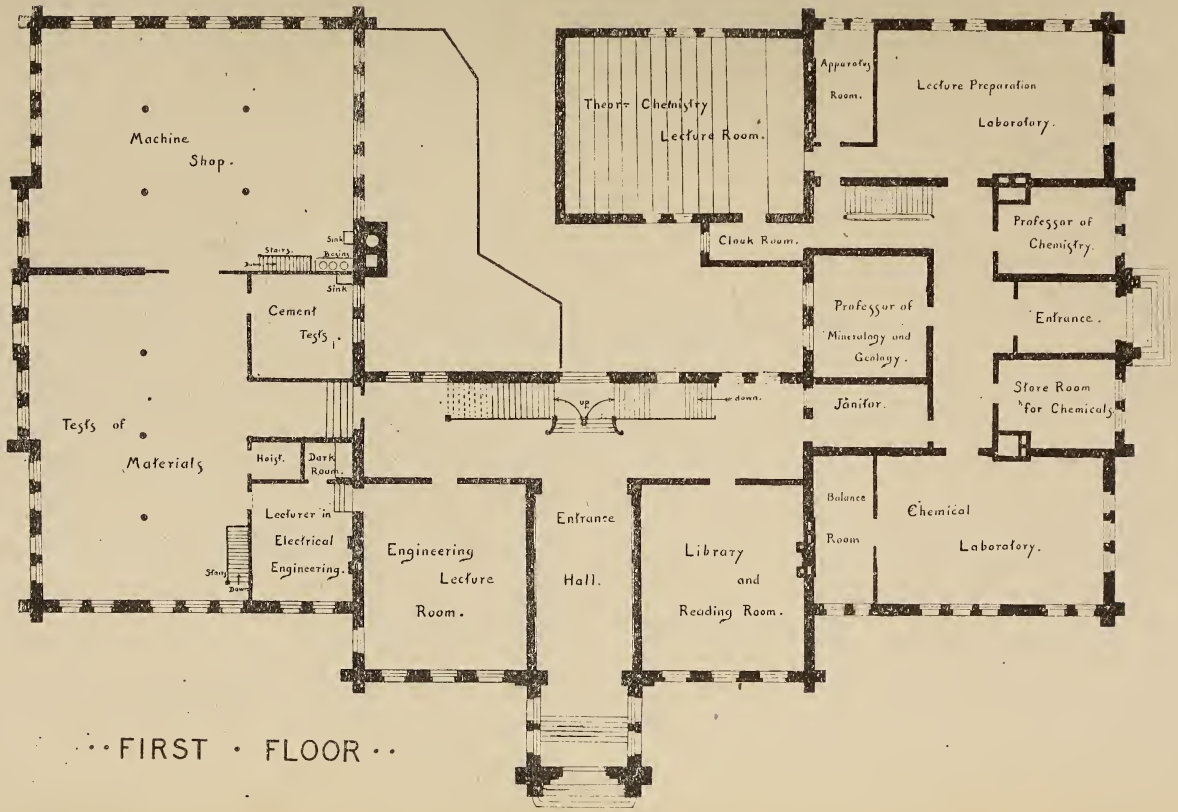
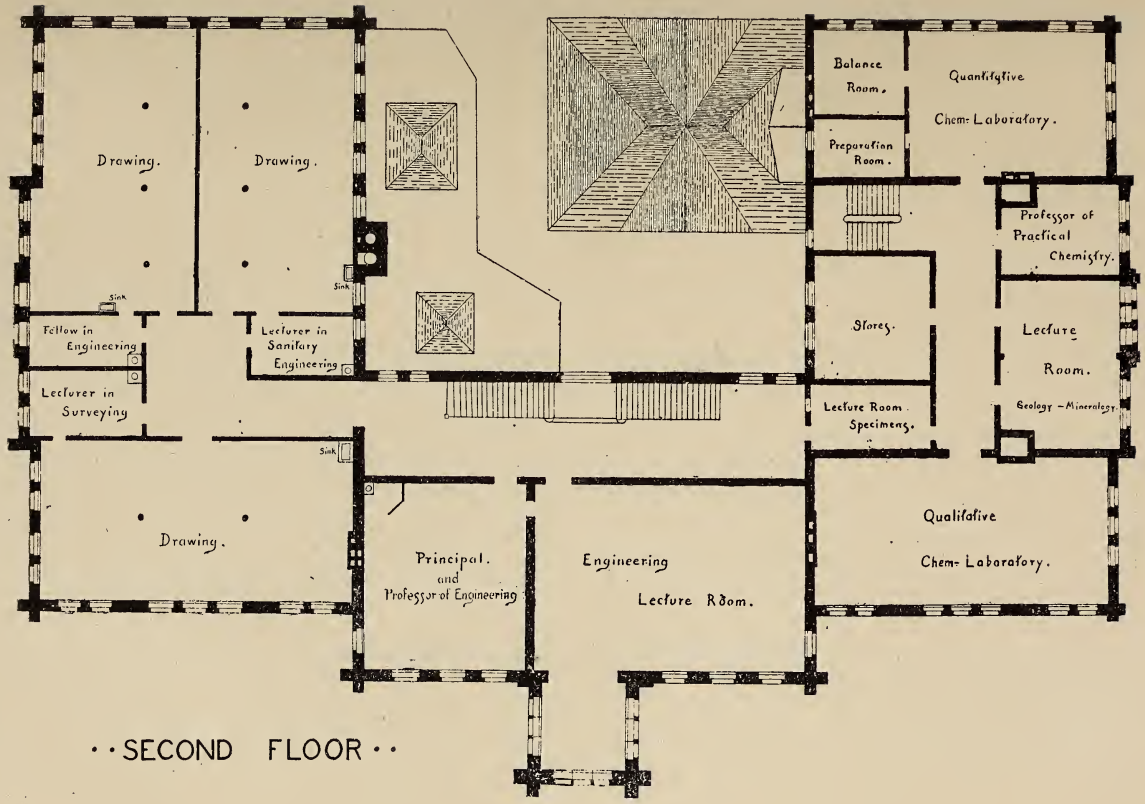


··GROUND · FLOOR ··


Machine Shop.
Stairs.
Sink
Basins
Sink
Cement Tests.
Tests of Materials
Hoist.
Dark Room.
Lecturer in Electrical Engineering.
Stairs
Down
Engineering Lecture Room.
Entrance Hall.
Library and Reading Room.
up
down
Theoret. Chemistry Lecture Room.
Cloak Room.
Apparatus Room.
Lecture Preparation Laboratory.
Professor of Chemistry.
Entrance.
Professor of Mineralogy and Geology.
Janitor.
Store Room for Chemicals.
Balance Room
Chemical Laboratory.

FIRST · FLOOR



SECOND FLOOR

Dais.
Assembly
Hall.
Museum.
Toxicological
Laboratory
Laboratory for
Sanitary
Chemistry.
Chemistry
Lecture
Room.
Museum.
Architectural
Lecture Room.
Drawing.
Lecturer
in
Architecture

THIRD FLOOR

Faculty of the School.

J. GALBRAITH, M.A., Assoc. M. Inst. C. E. Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., Assoc.M. Inst.C.E. ..... *Professor of Engineering* (*Chairman*)
W. H. ELLIS, M.A., M B ..... *Professor of Applied Chemistry.*
L. B. STEWART, P.L.S., D.T.S ..... *Lecturer in Surveying.* (*Secretary*)
C. H. C. WRIGHT, Grad. S.P.S ..... *Lecturer in Architecture.*
T. R. ROSEBRUGH, B.A., Grad. S.P.S ... *Lecturer in Electrical Engineering.*
CESARE J. MARANI, Grad. S.P. S ..... *Lecturer in Sanitary Engineering.*
*———— *Lecturer in Mining Engineering.*

ASSISTANT INSTRUCTORS.

*———— *Fellow in Engineering.*
W. ROSS, B.A ..... *Fellow in Applied Chemistry.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

E. J. CHAPMAN, Ph.D., LL.D ..... *Professor of Mineralogy and Geology*
JAMES LOUDON, M.A. ..... *Professor of Physics.*
R. RAMSAY WRIGHT, M.A., B.Sc ..... *Professor of Biology.*
W. H. PIKE, M.A., Ph. D ..... *Professor of Chemistry.*
ALFRED BAKER, M.A ..... *Professor of Mathematics.*
W. J. LOUDON, B.A ..... *Demonstrator in Physics.*
A. B. McCALLUM, B.A., M.B., Ph.D .... *Lecturer in Physiology.*
J. McGOWAN, B.A ..... *Fellow in Mathematics.*
W. F. SEYMOUR, B.A ..... *Fellow in Physics.*
W. G. MILLER, B.A ..... *Fellow in Mineralogy and Geology.*
J. J. McKENZIE, B.A ..... *Fellow in Biology.*

For information further than that contained in the Calendar, application may be made to the Secretary, L. B. STEWART.

* To be appointed before October 1st, 1891.

SESSION 1890-1

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

Department of Civil Engineering.

1st Year.

Abrey, G. S.
Ardagh, J. A.
Barker, H. F.
Charlesworth, L C.
Carroll, T. H.
Dunn, T. H.
Drake, H. D.
Francis, W. J.
Fitzsimmons, H.
Fairbairn, J. M.
Fraser, A. T.
Gormley, W.
Hinde, E. W.
Jones, J. E.
Laidlaw, J. T.
Lazier, D.
McLellan, J.
McPherson, A. J.
McFarlen, T. J.
McAllister, A. L.
Moore, H. H.
Matthews, M. E.
Mines, W.
Main, W. T.
Marani, V.
Speller, F. N.
Sims, H. B.
Sanderson, A. E.
Squire, R. H.
Taylor, W. V.
Topp, C. N.
Vickers, A. A.
Wallbridge, C. M.
Watson, R. B.
Watson, A.

2nd Year.

Alison, T. H.
Anderson, A. G.
Fairchild, C.
Forester, C.
Goodwin, J. B.
Hill, V.
Laschinger, E. J.
Laing, A. T.
Macallum, A. F.
McEntee, B.
Mitchell, C. H.
Prentice, J. M.
Playfair, N. L.
Rolph, H.
Ross, J. A.
Russel, R.
Smith, Albert.
Smith, Angus.
Thomson. R. W.

3rd Year.

Allan, J. R.
Beatty, H. J.
Deacon, T. R.
Dill, C. W.
Dunbar, M.
Lane, A.
McAllister, J. E.
Moore, J. E. A.
Newman, W.
Robinson, J. K
Russel, W.
Silvester, G. E.
Symmes, H. D.

Department of Mechanical and Electrical Engineering.

1st Year.

Bucke, W. A.
Boyd, D. G.
Graydon, P.
Goldie, A.
Hanly, S. C.
Hanly, J. B.
Job, H. E.
Lash, N. M.
Meek, C. S.
Robertson, J. M.
Robertson, C. G.
Smith, C. H.
Turbayne, W. A.

2nd Year.

Lea, W. A.
Milne, C. G.
White, A. V.

3rd Year.

Merrill, E. B.

Department of Architecture.

1st Year.

Ballantyne, H. F.
Ewart, J. A.
Fingland, W.
Michie, H. S.
Williams, R. E.

2nd Year.

Langley, C. E.

Department of Analytical and Applied Chemistry.

2nd Year.

Lawson, W.

3rd Year.

James, O. S.

SPECIAL STUDENTS.

CIVIL ENGINEERING.

2nd Year.

McCollum, T. B.

SURVEYING.

Fawcett, A.

ARCHITECTURE.

1st Year.

Keele, J.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

CIVIL ENGINEERING.

1881.—J. L. Morris, C. E., P.L.S., Pembroke.

1882.—J. McAree, P.L.S., D.T.S., Toronto.
D. Jeffrey, Contractor, Winnipeg.
J. H. Kennedy, C.E., P.L.S., Architect, etc., St. Thomas, Ont.

1883.—G. H. Duggan, Dominion Bridge Co., Montreal.
J. W. Tyrrell, C.E., P. and D.L.S., Hamilton.
D. Burns, P.L.S., Surveyor's Office, Toronto.

1884.—E. W. Stern, Chicago Bridge and Iron Co., Chicago, Ill.
A. R. Raymer, Louisville & Nashville R. R , Cumberland Gap, Tenn.
J. Robertson, P.L.S., Coad & Robertson, Civil Engineers, P. L. Surveyors, etc., Glencoe, Ont.
W. C. Kirkland, Canadian Pacific Railway.
J. McDougall, B A., Canadian Pacific Railway.

1885.—B. A. Ludgate, P.L.S., Peterborough, Ont.
O. McKay, P.L.S., Windsor.
E. E. Henderson, P.L.S., Canadian Pacific Railway, Brownville, Maine.
F. W. Bleakley, Seattle, W. T.
H. J. Bowman, P. and D.L.S., Berlin, Ont.

1886.—T. K. Thomson, Bridge Engineer, N. & W. R. R., Ceredo, W. Va.
H. G. Tyrrel, Pencoyd Bridge and Construction Co., Penn.
R. Laird, P.L.S., Canadian Pacific Railway.
A. M. Bowman, P. and D.L.S., Lindsay, Ont.
E. B. Hermon, P. and D.L.S., Vancouver, British Columbia.

1887.—A. E. Lott, Atcheson, Topeka and Santa Fe Railway, Topeka, Kansas.
J. Roger, P.L.S., 544 Lafayette Ave, St. Paul, Minn.
J. C. Burns. (Deceased).
C. H. Pinhey, P. and D.L.S., 630 Wellington Street, Ottawa.
A. L. McCulloch, P.L.S., Galt.
F. Martin, P.L.S., Toronto.

1888.—J. F. Apsey, P.L.S., Toronto.
W. T. Ashbridge, City Engineer's Office, Toronto.
E. F. Ball, Buffalo, N.Y.
D. B. Brown, P.L.S., Cornwall, Ont.
C. M. Canniff, City Engineer's Office, Toronto.
H. J. Chewett, Engineer's Office, Brantford, Ontario.
J. Gibbons, P.L.S, Renfrew, Ont.
R. McDowall, P L.S., Owen Sound, Ont.
G. W. McFarlen, P.L.S., Surveyor's Office, Toronto.
C. J. Marani, Fellow in Engineering, S.P.S., Toronto.
G. R. Mickle, B.A., Mining Engineer, Toronto.
J. H. Moore, P.L.S., Newmarket, Ont.
G. H. Richardson, Canadian Pacific Railway, Toronto.
K. Rose, Mexican Southern Railway, Old Mexico.
J. E. Ross, P.L.S., Beachburg. Ont.
C. H. C, Wright, Lecturer in Architecture, S.P.S., Toronto.

1889.—B. Carey, Engineer's Office, Toronto.
W. J. Chalmers, Mohawk, Ont.
W. A. Clement, City Engineer's Office, Toronto.
G F. Hanning, City Engineer's Office, Toronto.
H. E. T. Haultain, Manager St. Mauritius Mines, Barringen, Bohemia.
J. Irvine, Harriston, Ont.
D. D. James, Surveyor's Office, Toronto.
F. X. Mill, Engineer's Office, Brockville.
H. K. Moberly, Virginia, U. S.
T. R. Rosebrugh, B.A , Demonstrator in Engineering Laboratory, S.P.S., Toronto.
T. Wickett, Belleville.

1890.—Bowman, F. M., Surveyor's Office, Willowdale, Ont.
Bucke, M. A., Manufacturing Works, London, Ont.
Corrigan G. D., Union Pacific Railway, Seattle, W. T.
Duff, J. A. (B.A.), Leslie Brothers Manufacturing Company, Paterson, N. J.
English, A. B., 106 Gould Street, Toronto.
Garland, N. L., Eglinton, Ont., (Architecture).
Hutcheon, J., Nassagaweya, Ont.
Innes, W. L., C. P. R. Eng. Office, Toronto.
Merrill, E. B., Univ. of Toronto.
Pedder, J. R., Berlin Water Works Dept., Ont.
Wiggins, T. H.. Ont. and Rainy River Railway Co., Port Arthur, Ont.
Withrow, W. J., Quebec Central Railway, Que.

MECHANICAL ENGINEERING.

1890.—Ross, R. A., Edison Electric Co., Peterboro', Ont.

ANALYTICAL AND APPLIED CHEMISTRY.

1890.—Boustead, W. E., Lecture Assistant Chem. Laboratory Univ. College.

FELLOWSHIPS.

Two fellowships, one in Engineering and the other in Applied Chemistry, have been established, open to graduates of the school.

Each fellowship is of the value of $500 per annum, paid in eight monthly instalments.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

PRIZEMEN.

1879.—	I. Year	J. McAree	1st prize.
1880.—	II. Year	J. L. Morris	1st prize.
1881.—	I. Year	G. H. Duggan	1st prize.
	II. Year	D. Jeffrey	1st prize.
1882.—	I. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	II. Year	G. H. Duggan	1st prize.
	III. Year	D. Jeffrey	1st prize.
1883.—	I. Year	B. A. Ludgate	1st prize.
	" "	A. M. Bowman	2nd prize.
	II. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	III. Year	G. H. Duggan	1st prize.
1884.—	II. Year	B. A. Ludgate	1st prize.
	III. Year	E. W. Stern	1st prize.
	" "	A. R. Raymer	2nd prize.
1885.—	I. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
	II. Year	T. K. Thompson	1st prize.
	III. Year	B. A. Ludgate	1st prize.
1886.—	I. Year	C. H. C. Wright	1st prize.
	" "	J. E. Ross	2nd prize
	II. Year	A. E. Lott	1st prize

1887.—	I. Year	H. E. T. Haultain	1st prize.
	II. Year	C. H. C. Wright	1st prize.
	III. Year	A. E. Lott	1st psize.
	" "	J. Roger	2nd prize.
1888.—	I. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	II. Year	D. D. James	1st prize.
	III. Year	C. H. C. Wright	1st prize.
1889.—	I. Year	J. K. Robinson	1st prize.
	" "	G. E. Silvester	2nd prize.
	II. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	III. Year	D. D. James	1st prize.
1890.—	I. Year	C. Fairchild	1st prize.
	II. Year	J. K. Robinson	1st prize.
	III. Year	F. M. Bowman	1st prize.
	" "	E. B. Merrill	2nd prize.

UNIVERSITY OF TORONTO.

DEGREE OF C. E.

Date of Admission.	
1885	J. L. Morris.
1886	J. H. Kennedy.
1889	J. W. Tyrrell.

School of Practical Science.

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1891-92.

In the session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council, on the 3rd day of February, 1877.

By the scheme thus approved of, the government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order in Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted :

1. Civil Engineering (including Mining Engineering).
2. Mechanical and Electrical Engineering.
3. Architecture.
4. Analytical and Applied Chemistry.
5. Assaying and Mining Geology.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also to give him such a training as will make him immediately useful when he enters into active professional work.

The facilities possessed by the School for affording professional instruction are now being largely increased by additions to the building, equipment and teaching staff. An Engineering Laboratory is being formed which will be furnished with testing machines for testing the strength, elasticity and other qualities of materials of construction, and also with an experimental steam plant, consisting of engine, boiler, pumps, etc., for making experiments in the economical use of steam. The laboratory will be provided with pumps, tanks, turbines and other appliances necessary for conducting hydraulic experiments. It will be supplied with all necessary standard gauges, scales and measuring instruments. There will also be a full equipment of dynamos, motors, accumulators, electric lamps, measuring apparatus, etc , for the purpose of instruction in electrical engineering. There will be in connection with the laboratory a machine shop for the purpose of preparing specimens to be tested, making repairs, etc.

In Surveying, Geodesy and Practical Astronony all the necessary instruments will be provided. Among the additions in this department will be a carefully laid out 100 feet standard of length.

The Architectural Department will be supplied with a large number of models, casts and photographs.

In the Chemical Department a new laboratory has been fitted up with accommodation for eighty students. This has greatly improved the efficiency of the Department by relieving the overcrowding which has been much felt of late.

These additions and improvements are in progress and many of them are now sufficiently advanced to enable a large amount of new work to be done next session.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour the Lieutenant-Governor in Council the 19th day of March, 1890.

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be Chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma will be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments:—

(1) Civil Engineering (including Mining Engineering).
(2) Mechanical and Electrical Engineering).
(3) Architecture.
(4) Analytical and Applied Chemistry.
(5) Assaying and Mining Geology.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. In order to obtain the Diploma of the School in one of the above Departments a candidate must have passed the Matriculation Examination required for admission to a University in any part of Her Majesty's Dominions, or the Entrance Examination of the Law Society of Upper Canada, or of the College of Physicians and Surgeons, or of the Royal Military College at Kingston, or any of the Examinations prescribed for Teachers in Public or

High Schools of the Province of Ontario, or must present a certificate signed by a Head Master of a High School or Collegiate Institute, or by the Principal of Upper Canada College, or the Head Master of Trinity College School, Port Hope, that he possesses qualifications equivalent to those required for such teachers.

6. Special Students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper.

7. Certificates of attendance and standing may be given upon due examination to Special Students, and such students shall not be required to pass an Entrance Examination.

8. At the end of the Academic Year, examinations will be held in the different subjects taught, and prizes will be awarded for excellence in each Department. Candidates for Diplomas and Certificates are required to enter for these.

9. All Regular Students shall be in attendance at the School during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

10. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respec, tive Years and Departments :—

Subject.	Civil Engineering.			Mechanical and Electrical Engineering.			Architecture.		
	I Year.	II Year.	III Year.	I Year.	II Year.	III Year.	I Year.	II Year.	III Year.
Applied Mechanics.	8	7	8	13	16	12	8	7	8
Descript. Geometry	6	12	11	10	7	11	6	7	11
Surveying.....	9	4	4	0	0	0	2	0	0
Architecture.....	0	0	0	0	0	0	7	9	10
Total.....	23	23	23	23	23	23	23	23	29

The above minimum number of drawings will include only such drawings as shall be specially prescribed for the purpose.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned minimum number of drawings must be made, together with as many practice sheets as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The marks alloted to the above-mentioned minimum number of drawings form two-thirds of the total marks allotted in this subject.

The drawings must be made on paper 15 x 22 inches, unless otherwise prescribed.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the school without permission.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No field notes will be counted which have not been taken in the field and during the hours allotted to such work.

Vacation Work,

Vacation Work must be handed in during the first week of the ensuing session, otherwise it will not be counted.

Vacation notes must be on construction only and consist of not less than 20 nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap and consist of not less than 20 nor more than 30 pages.

The minimum percentage of marks required for practical work will be required in the case of vacation notes and theses.

No notes whatever, whether made during the session or the vacation, will be counted unless made in the standard note books of the School.

The thesis for the second year in the Architectural Course should give the date when the sketches are made, where and from what taken, also the description of the different points of interest, either of construction or design.

The sketches are to be made on one side of the sheet of a large sketch book and mounted on cardboard or paper 15″ x 22″.

The Architectural students are advised to spend the vacation in an architect's office.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations will begin on the first day of the session.

In the case where a candidate fails to pass a supplemental examination, it will count as one of the two supplemental examinations which may be allowed him after the next annua examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between nine a.m. and five p.m. at the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

Prizes.

In the combined departments of Civil and Mechanical and Electrical Engineering two prizes are open for competition in each year; the first prize of the value of $10.00. the second of $5.00.

These will be awarded to the students who stand first and second in general proficiency in the subjects of the year, under the following conditions, viz. :—

The candidate must have passed in each subject and have obtained at least 75 per cent. of the total number of marks allotted to the subjects.

Through the liberality of Mr. D. B. Dick, Architect, Toronto, a prize of $10.00 in books will be open annually for competition in the first year of the Architectural Department, subject to the same conditions as above.

REGULAR EXAMINATIONS.

The following is an approximate list of the examinations to be held and of their relative values in the competition for prizes :—

DEPARTMENTS OF CIVIL ENGINEERING, MECHANICAL AND ELECTRICAL ENGINEERING, AND ARCHITECTURE (I. II. AND III.).

I. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Algebra.	100....	Statics.
100....	Euclid.	100....	Dynamics.
100....	Plane Trigonometry.	100....	Descriptive Geometry.
100....	Analytical Geometry.	100....	Surveying.
100....	‡History of Architecture.	100....	Chemistry, Elementary.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100	*Field Notes.
30.....	Construction Notes.
100.....	†Experimental Physics.
100.....	Practical Chemistry.

II. Year.

Examinations held at end of Session.

Value.	Subject.	Value.	Subject.
100....	Calculus.	100....	Strength of Materials.
100....	*Astronomy.	100..	*†Rigid Dynamics.
100....	Optics.	100....	†Theory of Mechanism.

*Civil Engineering only. †Mechanical and Electrical Engineering only. ‡Architecture only.

100.... Hydrostatics.
100.... †Magnetism & Electricity.
100....‡History of Architecture.
100....‡Orders of Architecture.
100....‡History of Ornament.
100.... Descriptive Geometry.
100...‡*Surveying.
100...*†Spherical Trigonometry and *Geodesy.
100.... Chemistry, Theoretical.
100.... Chemistry, Applied.
100...‡*Mineralogy and Geology.
100....*Mineralogy, Practical.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....*Field Notes.	
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).
100.....	Chemistry, Practical.

III. Year.

Examinations held at end of Session.

Value,	Subject.	Value.	Subject.
100....	†Magnetism and Electricity.	100....	Theory of Compound Stress.
100....‡	History of Architecture.	100...‡*	Theory of Construction.
100....‡	History of Ornament.	100....†	Mechanics of Machinery.
100....‡	Principles of Decoration.	100....†	Machine Design.
		100....	Hydraulics.
		100...*†	Thermodynamics.
		100....	Descriptive Geometry.
		100....*	Practical Astronomy and Geodesy.
		100...‡*	Surveying and Levelling.
		100....	Chemistry, Applied.
		100...‡*	Mineralogy and Geology.
		100....*	Mineralogy, Practical.

Examinations held during the Session.

Value.	Subject.
300.....	Drawings.
100.....*Field Notes.	
100.....	Construction Notes.
100.....	Experimental Physics.
100.....	Thesis (at beginning of Session).

*Civil Engineering only. †Mechanical and Electrical Engineering only. ‡Architecture only.

REGULAR COURSES FOR THE DIPLOMA.

See regulations 2, 3, 4, 5, 8, 9, 10.: pp. 12 and 13.

The fees (payable through the Principal to the Provincial Treasurer) for instruction in any of the Departments, are as follows :—

First Year : Thirty-four Dollars.

Second Year : Forty-four Dollars.

Third Year : Fifty-four Dollars.

These are payable in two equal instalments, one in each term. A discount of two dollars will be made on each instalment if paid before the end of the first month of the term in which it is due. There is no extra fee for the Diploma.

The discount on the instalment payable in the first term will not be allowed unless all deposits or other dues are paid at the same time.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Mining Engineering).
(2) Mechanical and Electrical Engineering).
(3) Architecture.
(4) Analytical and Applied Chemistry.
(5) Assaying and Mining Geology.

FORM OF DIPLOMA.

THE

School of Practical Science,

PROVINCE OF ONTARIO.

(ESTABLISHED 1878).

THIS IS TO CERTIFY *that*

.....

of the.....*in the*.....

.....*has completed the Regular Course*

of this School for the Diploma in the.....

extending over a period of three years, and comprising theoretical and practica instruction in the following subjects, viz. :

.....

.....

.....

WHEREFORE *the said*.....

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

.....*One thousand eight hundred and*.....

and have caused the seal of this School to be hereunto affixed.

.....*Chairman.*

[L. S.]

.....*Secretary.*

ESTIMATED EXPENSES OF A REGULAR COURSE.

NOTE.—Each Student is required to provide himself with the following drawing instruments and materials, viz :—

One drawing-board, 23″ x 31″; 1 T square, 31 inch : 2 set squares, 60° and 45°, not less than 6″ on the side ; 1 6″ (or larger) protractor ; 1 12″ triangular scale, containing 10, 20, 30, 40, 50 and 60 chain scales ; 1 12″ triangular scale, containing $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$; 1, 2 ; $\frac{3}{8}$, $\frac{3}{4}$; $1\frac{1}{2}$, 3 ; $\frac{1}{5}$, $\frac{1}{10}$, open divided scales ; 1 drawing pen ; 1 pair dividers ; 1 pair compasses with ink and pencil points, lengthening bar, etc. ; 1 set spring bows, crow-quill pens, French curves, 1 2ft. pocket rule, Arkansas oil stone, thumb-tacks, paper, tracing vellum, pencils, rubber, colors, sponge, brushes, nest of saucers, water mug, etc., and one portfolio for drawings.

The expenses of a Regular Course are approximately as follows :—

Sessional Fees	$120 00
Books, instruments, drawing materials, laboratory fees, etc, about as follows— I. Year, $60.00 ; II. Year, $40.00 ; III. Year $30.00	130 00
Total for Regular Course	$250 00

Each student in this department is required to deposit $1.00 per annum in advance for the purpose of covering breakages and losses occurring to apparatus and furniture.

Making this deposit will, however, not free any student from the liability to make good any loss or damage to instruments or furniture, arising from want of proper care on his part, when the above fund may prove insufficient for the purpose.

DEPARTMENT OF

TIME TABLE OF REGULAR

Instruction will be given during the session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Drawing.	Drawing.
10-11	Drawing.	
11-12	*Geometry and Trigonometry.	
12-1	Statics.	Descriptive Geometry.
1-2		
2-3	Drawing.	Surveying (lecture).
3-4		
4-5		Field Work.

SECOND YEAR.

9-10	Strength of Materials.	*Astronomy. (*a*)
10-11	Drawing.	*Calculus.
11-12	*Physics. (*b*)	*Physics. (*a*)
12-1	Chemistry.	Practical Mineralogy. (*b*) Drawing.
1-2		
2-3	*Experimental Physics.	Applied Chemistry.
3-4	Practical Mineralogy. (*b*)	
4-5	El. Mineralogy & Geology.	Field Work.

THIRD YEAR.

9-10	Geodesy.	Drawing.
10-11	Drawing.	Astronomy (Practical)
11-12	Theory of Comp. Stress.	Constructive Design.
12-1	Applied Chemistry.	Mineralogy.
1-2		
2-3	Constructive Design.	Thermo-dynamics.
3-4	Drawing.	Field Work.
4-5		

* In the University of Toronto.

Additional lectures are given at hours not specified in above time-table and when the weather will not permit of field work.

CIVIL ENGINEERING.

COURSE IN CIVIL ENGINEERING.

1891-92. according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Drawing,	Drawing. *Conics.	Elem. Chemistry or Drawing.
Statics.	Drawing.	*Algebra. Dynamics.
Drawing. Chemistry (lecture).	*Trigonometry. (*a*) Field Work.	*Trigonometry. (*a*) Field Work.

SECOND YEAR.

Strength of Materials. Drawing. Practical Chemis y.	*Astronomy. Descriptive Geometry. Physics, (Hydrostatics and Optics). Spherical Trigonometry.	*Calculus. *Physics, (Hydrostatics (*a*) and Optics. Drawing. Chemistry.
Rigid Dynamics. Drawing. El. Mineralogy & Geology.	Applied Chemistry. Field Work, (*a*) App. Chem. & Exp. Physics. (*b*)	Theory of Surveying Instruments. Field Work.

THIRD YEAR.

Drawing. Hydraulics. Descriptive Geometry. Mineralogy. (*b*)	Drawing. Practical Mineralogy.	Applied Chemistry. Astronomy (practical) Hydraulics. Drawing.
Drawing.	Thermodynamics. Field Work.	Field Work. (*a*) *Exper. Physics (*b*)

(*a*) During First Term. (*b*) During Second Term.

This time-table is subject to modification, when necessary, to prevent conflict of hours.

DEPARTMENT OF

TIME-TABLE OF REGULAR COURSE IN

Instruction will be given during the session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Drawing.	Drawing.
10-11		
11-12	*Geom. (*a*), Trigonom. (*b*).	
12-1	Statics.	Descriptive Geometry.
1-2		
2-3		Surveying (lecture).
3-4	Drawing.	Drawing. (*a*)
4-5		*Exper. Physics. (*b*)

SECOND YEAR.

9-10	Strength of Materials.	Drawing.
10-11	Drawing.	*Calculus.
11-12	*Physics (*b*).	*Physics.
12-1	Chemistry (lecture).	Drawing.
1-2		
2-3		Applied Chemistry.
3-4	*Experimental Physics.	Drawing.
4-5		

THIRD YEAR.

9-10	Drawing.	Drawing.
10-11		Machine Design.
11-12	Theory of Compound Stress.	Drawing.
12-1	Applied Chemistry.	
1-2		
2-3		Thermodynamics.
3-4	*Experimental Physics.	Drawing.
4-5		

* In the University of Toronto.

This Time-table is subject to modification when necessary, to prevent conflict of hours.

ENGINEERING.

MECHANICAL AND ELECTRICAL ENGINEERING.

1891-92, according to the subjoined Programme.

FIRST YEAR.

Wednesday.	Thursday.	Friday.
Drawing. Statics.	Drawing. *Conics. Drawing.	Practical Chemistry or Drawing. *Algebra. Dynamics.
Drawing or Practical Chemistry. Chemistry (lecture).	*Trigonometry. (*a*) Drawing.	*Trigonometary. (*a*) Drawing. *Experi. Physics. (*b*)

SECOND YEAR.

Strength of Materials. Drawing. Practical Chemistry.	Theory of Mechanism. Descriptive Geometry. *Physics. (*b*) Spherical Trigonometry.	*Calculus. *Physics. Chemistry.
Rigid Dynamics. Drawing.	Applied Chemistry. Drawing or *Experimental Physics.	Theory of Mechanism. Drawing or *Experimental Physics

THIRD YEAR.

Drawing. Hydraulics. Descriptive Geometry. Drawing.	Drawing. Mechanics of Machinery. Drawing.	Applied Chemistry. Machine Design. Hydraulics. Drawing.
*Experimental Physics.	Thermodynamics. Drawing.	*Experimental Physics

(*a*) During First Term. (*b*) During Second Term.

Hours will be arranged during the session for special instruction in Electricity in addition to the work in this subject under the head Physics.

DEPARTMENT OF

TIME TABLE OF REGULAR

Instruction will be given during the session of

FIRST YEAR.

Hours.	Monday.	Tuesday.
9-10	Drawing.	Drawing.
10-11	Drawing.	Drawing.
11-12	*Geometry. (a) *Trigonometry. (b)	Drawing.
12-1	Statics.	Descriptive Geometry.
1-2		
2-3	Drawing.	Surveying (lecture).
3-4	Drawing.	Surveying (lecture).
4-5	Drawing.	Field Work.

SECOND YEAR.

Hours.	Monday.	Tuesday.
9-10	Strength of Materials.	History of Architecture.
10-11	Drawing.	*Calculus.
11-12	Drawing.	*Physics.
12-1	Chemistry (lecture).	Pen and Ink.
1-2		
2-3	*Experimental Physics.	Applied Chemistry.
3-4	*Experimental Physics.	Applied Chemistry.
4-5	El. Mineralogy & Geology.	Field Work.

THIRD YEAR.

Hours.	Monday.	Tuesday.
9-10	Drawing.	Drawing.
10-11	Drawing.	Drawing.
11-12	Theory of Com. Stress.	Constructive Design.
12-1	Applied Chemistry.	Mineralogy.
1-2		
2-3	Constructive Design.	Drawing.
3-4	Drawing.	Drawing.
4-5	Principles of Decoration.	Drawing.

* In the University of Toronto.

Additional lectures are given at hours not specified in above time table and when the weather will not permit of field work.

ARCHITECTURE.

COURSE IN ARCHITECTURE.

1891-92 according to the subjoined Programme.

FIRST YEAR.

WEDNESDAY.	THURSDAY.	FRIDAY.
Pen and Ink Drawing. History of Architecture. Statics.	Drawing. *Conics. Drawing.	Elementary Chemistry or Drawing. Algebra. Dynamics.
Elementary Chemistry or Drawing. Chemistry (lecture).	*Trigonometry. (a) Field Work.	*Trigonometry. (a) Field Work.

SECOND YEAR.

Strength of Materials. Drawing. Practical Chemistry.	Orders of Architecture. Descriptive Geometry. *Physics (Hydrostatics and Optics). History of Ornament.	*Calculus. *Physics (Hydrostatics and Optics). Drawing. Chemistry (lecture).
Drawing. El. Mineralogy & Geology.	Applied Chemistry. Field Work.	Theory of Surveying Instruments. Field Work.

THIRD YEAR.

Drawing. Hydraulics. Descriptive Geometry. Mineralogy. (b)	Drawing.	Applied Chemistry. History of Architecture. Hydraulics. History of Ornament.
Drawing. Sanitary Science.	Drawing.	*Experim'l Physics (b) Field Work. (a)

(a) During First Term. (b) During Second Term.

This time table is subject to modification, when necessary, to prevent conflict of hours.

I. DEPARTMENT OF CIVIL ENGINEERING.

(Including Mining Engineering).

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Mining Engineers).

Students who wish to devote themselves to the practice of Mining Engineering are allowed to take the work specially mentioned under this head, in the Third Year, and to omit the work in Experimental Physics.

They are advised, however, to take, if possible, the regular course in Civil Engineering and the special work subsequently as Special Students.

Subjects for the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry, Analytical Plane Geometry.

Mechanics.

Statics and Dynamics (with special reference to Structures and Machines).

Drawing.

Copying from the flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids. Orthographic (including Isometric) and Oblique Projection.

Surveying.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

Chemistry.

Elementary Chemistry, with Laboratory Practice.

Subjects for the Second Year.

Mathematics.

Differential and Integral Calculus,
Spherical Trigonometry.

Physics.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

Experimental Physics.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Telescope and Microscope, and of Reflecting instruments.

Drawing.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and Structures. (Drawings made from both copies and original notes.)

Engineering and Surveying.

Statics and Dynamics. (Pure and applied.)
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Hydrographic Surveying.
Mining Surveying.
Principles of Geodesy (considering the earth a sphere.

Chemistry.

General Chemistry.
Practical Chemistry.
Chemistry (Applied.)
Combustion, Fuel, and Furnaces.
Metallurgy of Iron and Steel.

Mineralogy and Geology.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

Subjects of the Third Year.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry. Principle of least Squares.

Drawing.

Subjects of previous years continued.

Descriptive Geometry.

- Shades and Shadows.
- Stone cutting.
- Perspective Projection.

Original Designs—Bridges, Roofs, Floors, Arches, etc.

Engineering and Surveying.

Statics and Dynamics. (Pure and applied.)

Strength and Elasticity of Materials.

Theory of Construction.

Practical Designs.

- Bridges, Roofs Floors.
- Arches, Retaining Walls.
- Foundations. etc.

Thermodynamics and Theory of the Steam Engine.

Hydraulics.

Experimental work in Engineering Laboratory.

Levelling.

Profiles, Cross-sections, field work and Plotting.

Computation of quantities.

Mathematical Theory of Surveying Instruments.

Trigonometrical and Barometrical Levelling.

Geodesy (considering the earth a Spheroid.)

Practical Astronomy (treated in the manner required for the P.L.S. and D.L.S Examinations.)

Chemistry (Applied.)

Artificial Lighting,

Photography.

Explosives.

Mortars and Cements.

Bricks and Artificial Stones.

Preservation of Wood, Iron and Stone.

Water, Air and Sewage.

*Metallurgy, with special reference to Copper, Lead, Silver and Gold.

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*Mining Engineering only.

MINERALOGY AND GEOLOGY.

Economic Minerals of Ontario.
Blowpipe Analysis and Determinative Mineralogy.
*Assaying and Mining Geology, Mining Calculations.
*Crystallography and Palæontology.

II. DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

SUBJECTS OF THE FIRST YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to Structures and Machines).

EXPERIMENTAL PHYSICS.

Light: Use of the Heliostat and Spectroscope.
Experiments with Lenses and Mirrors.
Theory of the Microscope and of Reflecting Instruments.

DRAWING.

Copying from the Flat, Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

(Lectures only, applications of Trigonometry and Principles of Measurement.)

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

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*Mining Engineering only

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Physics.

Hydrostatics.
Optics.
Magnetism.
Electricity.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry.

Drawing.

Subjects of first year continued.
Coloring and Shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and Structures. (Drawings made from both copies and original notes.)

Engineering.

Statics and Dynamics (Pure and Applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials of Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

Chemistry.

Theoretical Chemistry.
Practical do
Applied do
Combustion, Fuel and Furnaces
Metallurgy of Iron and Steel.

Subjects of Third Year.

Experimental Physics.

Acoustics.
Electrical Measurements and Testing.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry :
Shades and Shadows.
Stone cutting.
Perspective Projection.

ORIGINAL DESIGNS.

Engine and Machine Design.

ENGINEERING.

Subjects of previous years continued.
Applied Mechanics :
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine
Hydraulics.
Electricity :
Dynamos and Motors.
Application of Principles to Practical Problems connected with the design, construction and testing of various Prime Motors and Machines.
Experimental work in Engineering Laboratory.

CHEMISTRY (APPLIED).

Artificial Lighting.
Photography.
Explosives.
Preservation of Wood, Iron and Stone.
Metallurgy.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam-engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

III. DEPARTMENT OF ARCHITECTURE

This course is designed to afford the necessary preliminary training to students intending to become Architects.

I. Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

Mechanics.

Statics (with reference to Structures).
Dynamics (preliminary to the study of Hydraulics).

Drawing.

Instrumental and Free-hand, Copying from the Flat, Lettering, Pen and Ink, Descriptive Geometry (Plane Surfaces).

History of Architecture.

Egyptian, Assyrian and Persian.

Surveying.

Principles, Chain Surveying, Mensuration.

Chemistry.

Elementary Chemistry with Laboratory Practice.

II. Year.

Mathematics.

Differential and Integral Calculus.

Physics.

Hydrostatics.
Optics.

Drawing.

Instrumental Drawing, Drawing from the Cast, Sketching and Water Color, Pen and Ink.
Descriptive Geometry (Curved Surfaces).

SURVEYING.

Use of Transit and Level.
Mensuration.

MECHANICS.

Statics (Pure and Applied).
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory

HISTORY OF ARCHITECTURE.

Classic.

ORDERS AND ELEMENTS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

Ancient and Classic.

CHEMISTRY.

General Chemistry.
Practical do
Applied do
Combustion, Fuels and Furnaces.
Metallurgy, Iron and Steel.

MINERALOGY AND GEOLOGY.

Elements.

III YEAR.

DRAWING.

Descriptive Geometry.
Shades and Shadows.
Perspective.
Stone Cutting.
Water Color Sketching.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

PHYSICS.

Acoustics, Electricity, Heat.

HISTORY OF ARCHITECTURE.

Early Christian, Gothic and Renaissance.

HISTORY OF ORNAMENT.

Early Christian, Gothic and Renaissance.

PRINCIPLES OF DECORATION.

CHEMISTRY (APPLIED).

Artificial Lighting, Photography, Mortars and Cements, Bricks, and Artificial Stone.
Preservation of Wood, Iron and Steel.
Water, Air, and Sewage.

THEORY OF CONSTRUCTION.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.
Experimental work in Engineering Laboratory.

MINEROLOGY AND GEOLOGY.

Economic Minerals of Ontario.

THE FOURTH YEAR.

In order to provide advanced work in the various departments and also to enable students to carry on experimental work in the laboratories with less interruption from attendance at lectures and other causes than is possible in the ordinary three years' course, it has been decided to establish a sessional course of instruction in each department to be known as the Fourth Year.

The diploma of the school will be given, as heretofore, to all candidates who fulfil the requirements of the ordinary three years course, and an extra certificate or diploma will be given to candidates who after having fulfilled the requirements of the three years course may succeed in properly qualifying themselves in the work of the fourth year.

The work for the Fourth Year Certificate or Diploma is as follows :—

Civil Engineering.

The work in this Department is divided into two groups between which an option must be exercised.

Group I.

The principal subjects of this group are :—

Method of Least Squares.
Theory of Observations.
Strength and Elasticity of Materials.
Mortars and Cements.
Hydraulics.
Thermodynamics.
Engineering Designs.

The work in connection with these subjects will be done principally in the engineering laboratory, which is supplied with various machines, apparatus and instruments necessary for experimental investigation.

Group II.

The subjects of this group are :—

Method of Least Squares.
Theory of Observations.
Topographical Surveying with Transit, Stadia, Micrometers, Plane Table, etc.

Practical Astronomy (extended to cover the D.T.S. examinations with special reference to the theory of astronomical instruments).

Advanced Geodesy.

In the basement of the school is laid out a 100 ft. standard of length arranged so that various conditions affecting the length of suryeyors' chains and tapes may be thoroughly investigated. Candidates will be required to take part in such work.

The school will also be equipped with some of the more important instruments used in spherical and geodetic surveying.

MECHANICAL AND ELECTRICAL ENGINEERING.

The subjects in this department are :—

Method of Least Squares.
Theory of Observations.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics.
Electricity.
Engine and Machine Design.

A great part of the work in connection with the above subjects will be done in the engineering laboratory. The time of the candidates will be principally devoted to tests in connection with boilers, engines, dynamos and electric motors.

ARCHITECTURE.

The subjects in this department are :—

Water-color Sketching.
Perspective.
Stereotomy.
Hydraulics.
Strength and Elasticity of Materials.
History of Architecture.
Design.
Specifications.

The laboratory work will consist of tests of the strength and elasticity of wood, iron and steel and of a course in cement and mortar testing.

ANALYTICAL AND APPLIED CHEMISTRY.

Students of the Fourth Year may select either of the following courses:

(*a*) Industrial Chemistry:

Physics, Chemistry, Pure and Applied, with Laboratory work in General and Technical Analysis.

(*b*) Metallurgy:

Including Mineralogy and Geology, Chemistry, Pure aud Applied, with Laboratory work in Mineral Analysis and Assaying.

(*c*) Sanitary Chemistry:

Including Physiology and Bacteriology, Chemistry, Pure and Applied, with Laboratory practice in Toxicology, and the Analysis of Food, Water, and Air.

Graduates of the University of Toronto in the Department of Chemistry and Mineralogy and graduates in the Department of Natural Sciences who have taken First Class Honors will be admitted to the Fourth Year in Analytical and Applied Chemistry.

In all departments, the candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested at the annual examinations, by their ability to translate extracts from scientific works or periodicals not previously specified. Candidates will be admitted free of charge to any lectures in French or German in the University, which their other work may allow them to attend.

Courses of reading in connection with subjects of study will be indicated in each Department.

The fee for the Fourth Year is $54.00, subject to the conditions as to discounts, etc., stated on page 19.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and the Survey of Lands.

" 12. (2) Any person who has followed a regular course of study at the Ontario School of Practical science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study, of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyer, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service; or, in case he has only received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

" (3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

" 14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed."

Extract from the Dominion Lands Act.

"Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized,

and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause."

The fee for special students in Surveying is $34 per session.

The attention of Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884:—

DEGREE OF C. E.

BY THE SENATE OF THE UNIVERSITY OF TORONTO.

Be it enacted:

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C.E. be hereby established, to be granted subject to the following conditions and regulations:—

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.
5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.
6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.
7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate, not later than the first day of February.
8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.
9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.
10. The examination of the essay, drawings and estimates and any further examination of the candidate that may be considered necessary, may be held in May.
11. The fee for the degree of C.E. shall be $20, and shall be paid to the Registrar not later than the first day of May.
12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.

IV. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists, industrial chemists, or teachers, and also to furnish instruction in chemistry and its useful applications, to students of engineering and architecture, and to special students who may desire such instruction.

Subjects of the First Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

Mechanics.

Statics and Dynamics.

Experimental Physics.

Light: Use of the Heliostat and Spectroscope. Experiments with Lenses and Mirrors. Theory of the Microscope and Reflecting Instruments.

Drawing.

Copying, Lettering, Model drawing.
Descriptive Geometry,

Biology.

Modern Languages.

French.
German.

Chemistry.

Inorganic Chemistry with Laboratory work.

Subjects of the Second Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Phyics.

Hydrostatics.
Optics.
Magnetism.
Electricity.

Experimental Physics.

Heat: Use of the Cathetometer, Dividing Engine, and Spherometer. Thermometry and Calorimetry.

MODERN LANGUAGES.

French.
German.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

CHEMISTRY.

Organic Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative. Analysis.

SUBJECTS OF THE THIRD YEAR.

PHYSICS.

Thermodynamics.
Electricity.
Laboratory work.

PHYSIOLOGY.

MINERALOGY AND GEOLOGY.

CHEMISTRY.

Advanced Inorganic and Organic Chemistry.
History of Chemical Theory.
Physical Chemistry.
Applied Chemistry.
Laboratory work.

V. DEPARTMENT OF ASSAYING AND MINING GEOLOGY.

In this Department the student is fully prepared in all the methods of analysis necessary to render him a competent Assayer. He is also qualified to survey and report upon the value of mineral lands.

Subjects of First Year:

1. Elementary Mathematics, including Mensuration and Plane Trigonometry.
2. Elements of Natural Philosophy, including Mechanics and Hydraulics.
3. Inorganic Chemistry.
4. Elementary Mineralogy and Blowpipe Practice.
5. Elementary Biology.
6. Physical Geography, Palæontology and Geology.
7. Drawing.

Subjects of Second Year:

1. Higher Mathematics, including Spherical Trigonometry, etc.
2. Chemistry, with Laboratory practice in Qualitative Analysis.
3. Blowpipe Analysis and Determinative Mineralogy.
4. Geology and Economic Minerals of Canada.
5. Surveying and Levelling.

Subjects of Third Year:

1. Qualitative Chemical Analysis.
2. Metallurgy.
3. Assaying.
4. Study of Metallic Veins and other Mineral Deposits, Mining Calculations, Examinations of Mineral Lands.

Synopsis of the Courses of Lectures

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT.

With Fees for Special Students.

The same discount for prompt payment will be allowed as in the case of Regular Students. *See p, 19,*

Special Students are advised to enter at the beginning of the Session (October 1st), as many subjects begun in the First Term are continued through the Second, and Lectures cannot be repeated.

I. CIVIL ENGINEERING; II. MECHANICAL AND ELECTRICAL ENGINEERING; III. ARCHITECTURE.

(Reductions will be made to Special Students taking several courses.)

☞Text-books for the First Year marked (*a*); for Second Year (*b*); for Third Year (*c*).

(I.) DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference,—Davidson's Projections.
Angel's Plane and Solid Geometry.
Binn's Orthographic Projection.
Church's Descriptive Geometry, (*a*) (*b*), (*c*).
Warren's Stone Cutting (*c*).
McCord's Lessons in Mechanical Drawing.
Worthen's Topographical Drawing (*a*), (*b*), (*c*).

Fees for Special Students, $14.

(II.) SURVEYING AND LEVELLING.

LAND SURVEYING—

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING—

Longitudinal and Cross Sections.
Plotting.

SETTING OUT—

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION—

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text-Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*).
Henck's or Trautwine's Railway Curves (*b*).

Fees for Special Students, $14.

(II.) PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE—

The work included in this course is sufficient to fulfil the requirements of the final examinations for Provincial and Dominion Land Surveyors.

In Astronomy the principal subjects are the determination of Time, Latitude and Azimuth, and the general principles of the methods of determining Longitudes. Practical instruction is given in the methods of taking observations.

In Geodesy all Surveys, Computations and Methods of Map Construction are based upon the supposition that the earth is a Sphere.

ADVANCED COURSE (FOURTH YEAR)—

The work in this course is intended to fulfil the requirements of the final examination for Dominion Topographical Surveyors. It is distinguished from the work in the Ordinary Course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In Geodesy the earth is considered as a Spheroid.

Text-Books.—Gillespie's Higher Surveying (*b*), (*c*).
Chauvenet's Spherical and Practical Astronomy (*c*).
Gore's Elements of Geodesy (*c*).
Nautical Almanac, 1892, (*c*).

Fee for Special Students, $19.

(IV.) APPLIED MECHANICS.

STATICS—

The Calculation of the Stresses in Framed Structures, Solid and Riveted Beams, Arches, etc. Both Graphical and Analytical Methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS—

DESIGNING OF STRUCTURES in Timber, Iron and Masonry—Arches, Retaining Walls, Foundations, Roofs, Bridges, etc.

DYNAMICS—

Representation and Measurements of Forces and Motions.
Principles of *Work* and *Energy*.
Efficiency of Machines. Friction.
Transmission of Energy—Belts, Shafts, Crank and Connecting Rod, etc.
Fly-Wheels, Governors.
Balancing of Machinery.
Etc., etc.

Strength of the Parts of Machines.

Machine Design—

Hydraulics—

Discharge of Water through Orifices, Notches, etc. Flow in Pipes and Open Channels. Water Power. Water Wheels, Turbines, Pumps, etc.

Thermo-Dynamics and Theory of the Steam Engine.

Text-Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
DuBois—Graphic Statics.
" Strains in Framed Structures.
Cotterill—Applied Mechanics (*a*), (*b*), (*c*).
Rankine—Applied Mechanics (*b*), (*c*).
" Steam Engines and other Prime Movers.
Unwin—Elements of Machine Design (*c*).
Shann—Elementary Treatise on Heat (*c*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Merriman—Hydraulics (*c*).
Jackson—Hydraulic Manual.
Neville—Hydraulic Tables and Formulæ.

Fees for Special Students, $19.

(V.) THEORY OF MECHANISM.

Principles of the Transmission of Motion without reference to Force.

Pitch Surfaces, Spur Wheels, Bevel Wheels, Skew-bevel Wheels, Trains of Wheelwork, Teeth of Wheels, Cams. Cranks, Eccentrics, Links, Bands and Pulleys, Hydraulic Connections, Frictional Gearing, Link Motion for Slide Valves, etc., etc.

Text-Books and Books of Reference.—Rankine—Machinery and Millwork.
Camus—Teeth of Wheels.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (c).
Cotterill—Applied Mechanics (*b*), (c).

Fee for Special Students, $19.

(VI.) ELECTRICITY.

Instruction will be given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University. The work will comprise :—

ELEMENTARY ELECTRICITY AND MAGNETISM.

MEASURING INSTRUMENTS—

Theory and uses in determining Current, Electromotive Force, Resistance, Capacity, Strength of Field, Magnetic Inductance, etc., etc.

MATHEMATICAL THEORY OF ELECTRICITY.

APPLICATIONS OF ELECTRICITY—

Laboratory work and lectures on Telegraph, Telephone, Dynamos their design and construction, Electric Lighting ; Arc and Incandescent Systems, Storage Batteries, Transmission of Power by Electricity, etc.

THEORY OF ALTERNATING CURRENT GENERATORS' AND TRANSFORMERS.

Text-Books and Books of Reference,—Thompson, S.P.—Elementary Electricity and Magnetism (b).
Stewart and Gee—Practical Physics (b).
Cumming—Theory of Electricity (c).
Thompson, S. P.—Dynamo Electric Machinery (c).
Kapp—Electric Transmission of Energy (d).
Blakesley—Alternating Currents (d)

Current numbers of the "Electrician," the "Electrical World" and "La Lumiere Electrique."

(VII.) ARCHITECTURE.

History of Architecture—

Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

Orders of Architecture.

History of Ornament.

Principles of Decoration.

Text-Books and Books of Reference.—T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Fergusson's History of Architecture.
Gwilt's Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture(b),(c)
Leed's Orders of Architecture (b).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.

(VIII.) MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the School.

(IX.) VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a Thesis (accompanied with drawings and specifications when necessary) during the subsequent vacation.

The student will also be required to make, during the vacation, full and clear notes of various constructions that may fall under his notice.

The value of both the Thesis and the construction notes will be taken into account in determining his standing at the next following examination.

CIVIL ENGINEERING.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.

Books of Reference.—Gilmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

MECHANICAL ANE ELECTRICAL ENGINEERING.

Subject of Thesis for Second Year.—Machine-shop Practice.
" " *Third* " Foundry Practice.

Books of Reference.—Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

ARCHITECTURE.

For the second year the following set of freehand pencil sketches will be required.

I. Doorway from the object;
II. Staircase " " "
III. Arched Bridge (stone) from the object;
and seven sheets from the object, prints or drawings, with plans and sections where possible.

Subject of the Thesis for the Second Year.—The above sketches.
" " *Third* " Sanitary Drainage.

Books of Reference for Third Year.--Waring--Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Any other works on the above subjects may be consulted, and results of original observations should be given.

IV. CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES BY THE PROFESSOR OF CHEMISTRY OF THE UNIVERSITY OF TORONTO.

Inorganic Chemistry.
Organic Chemistry.
Historical Development of Chemical Theory.
Physiological Chemistry.
Qualitative and Quantitative Analysis.

COURSES BY THE PROFESSOR OF APPLIED CHEMISTRY OF THE SCHOOL OF PRACTICAL SCIENCE.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuel, Furnaces, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air and Sewage, Metallurgy, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis of Food, Water and Air, and Toxicology.

V. MINERALOGY AND GEOLOGY.

COURSES OF LECTURES.

1. Elementary Course.—Rudiments of Mineralogy.
Geology and Palæontology.
Physical Geography.

Text Books and Books of Reference.—Chapman's Mineralogy and Geology of Canada, 3rd edition.
Dana's Manual of Mineralogy.
Dana's Text Book of Geology.
Page's Physical Geography.
Johnston's Elementary Physical Atlas.

2. Advanced Course.—Mineralogy and Crystallography.
Geology and Palæontology.
Mathematics and Crystallography.
Physical Geography.
Geology and Palæontology of Canada.

Text Books and Books of Reference.—Dana's System of Mineralogy.
Chapman's Geology of Canada.
Nicholson's Palæontology.
Chapman's Synopsis.

PRACTICAL COURSES.

1. Use of Blowpipe—Chapman's Blowpipe Practice.

2. Blowpipe Analysis, Determinative Mineralogy. Economic Minerals of Canada.

Kerl's Leitfaden bei qual. u. quant. Lothrohr-Untersuchungen, etc., Aufl. 2. Plattner's Blowpipe Treatise. Von Kobell's Tafeln. Chapman's Mineral Tables.

3. Assaying.—Mitchell's Assaying, by Crooks.
Kerl's Probirkunst.
Chapman's Assay Notes, 2nd edition.

4. Mining Geology.—*Books of Reference.*—Burat's Geologie Applique' and Cours d'Exploitation des Mines. Niederist's Bergbaukunde. Von Cotta's Erzlagerstatten.

ENGINEERING LABORATORY.

The Engineering Laboratory of the School occupies two floors of the new building, each floor having an area of 100ft. x 50 ft.

The upper floor is occupied by the testing department for materials of construction, and the machine shop. The former is now being equipped with a 50 ton Emery machine, built by Messrs. Wm. Sellers & Co., Philadelphia, for making tests in tension, compression and shearing. Machines for making bending and torsion tests will also be supplied. There will also be a complete set of apparatus for making tests of mortars and cements.

The machine shop will be furnished with a planing machine and several lathes, drills, vise-benches etc., and is intended principally for the preparation of specimens for testing and for making ordinary repairs

The lower floor will be devoted mainly to experimental work in connection with the measuring of power.

A 50 horse-power steam-jacketted automatic cut-off steam engine has been erected, the steam for which is furnished by a Babcock and Wilcox boiler. The engine is arranged to work either non-condensing, surface condensing or jet condensing, and will be equipped with all the necessary apparatus for making power measurements. The furnace and chimney are constructed so that experiments on draft and combustion may be carried on. Arrangements are being made to carry out hydraulic experiments on this floor. It is also proposed to do a large amount of work in electricity. For this purpose there will be a sufficient equipment of dynamos, motors, accumulator cells, lamps, dynamometers and electric measuring apparatus to carry on useful experiments in connection with large currents.

The shafting on both floors is arranged to be driven either by a gas engine, a steam engine, or electro-motors or partly by one means and partly by other.

In connection with the department of surveying a standard of length has been erected which contains both a 100 feet and a 66 feet standard. This will enable the various conditions which affect the length of surveyors' chains and tapes to be properly investigated.

PHYSICAL LABORATORY AND WORKSHOP.

(University of Toronto.)

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of Mechanics, Sound, Light, Heat and Electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an Elementary Laboratory, there are several special Laboratories, which offer unusual facilities for the conduct of experiments in the various branches of Physics.

The electrical apparatus includes Electrometers, Galvanometers, Resistance Coils and Bridges, Testing Keys, Batteries, Electrical Machines (Holz and Carre), Ruhmkorff Coils, Crooke's Tubes, Telephones, etc., etc.

The workshop contains a gas-engine, lathes and other tools.

MODERN LANGUAGES.

Students in the regular courses are admitted, without extra charge, to French and German classes in University College (see regulation 10, p. 13). No special examinations are held in these languages except in the Fourth Year, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, Etc.

The Library, Museums and Herbarium of the University of Toronto are open to regular students.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1890-91.

President ..... J. K. Robinson.
Vice-President ..... T. R. Deacon.

Secretary	C Fairchild.
Treasurer	W. A. Lea.
Corresponding Secretary	G. E. Silvester.
Librarian	A. Lane.
Representatives—Graduates'	Mr. Cesare J. Marani.
Third Year	J. E. A. Moore.
Second Year	C. E. Langley.
First Year	R. B. Watson.

The Society meets every second Tuesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

Membership fee, $1 per annum.

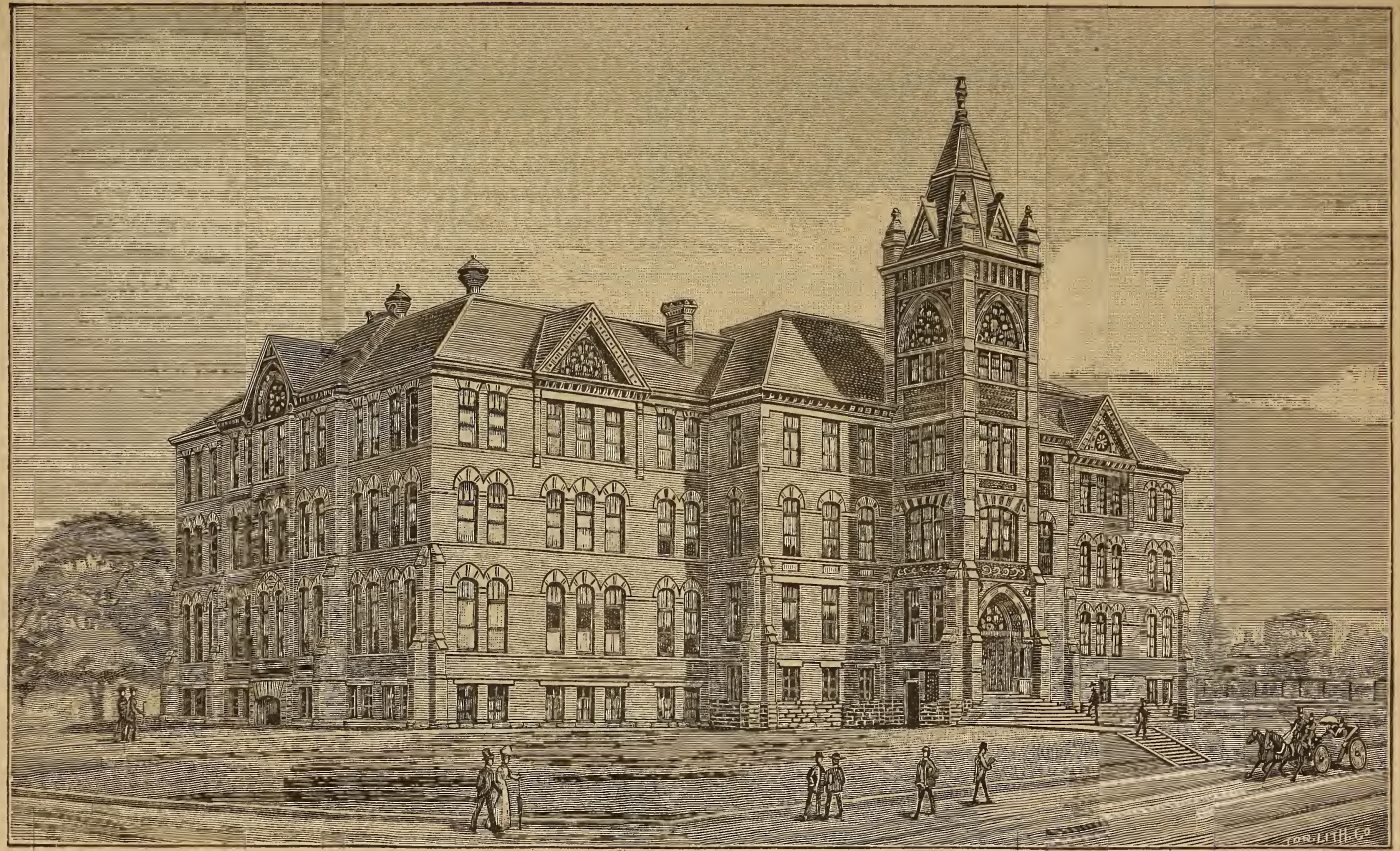
ATHLETIC ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1891.

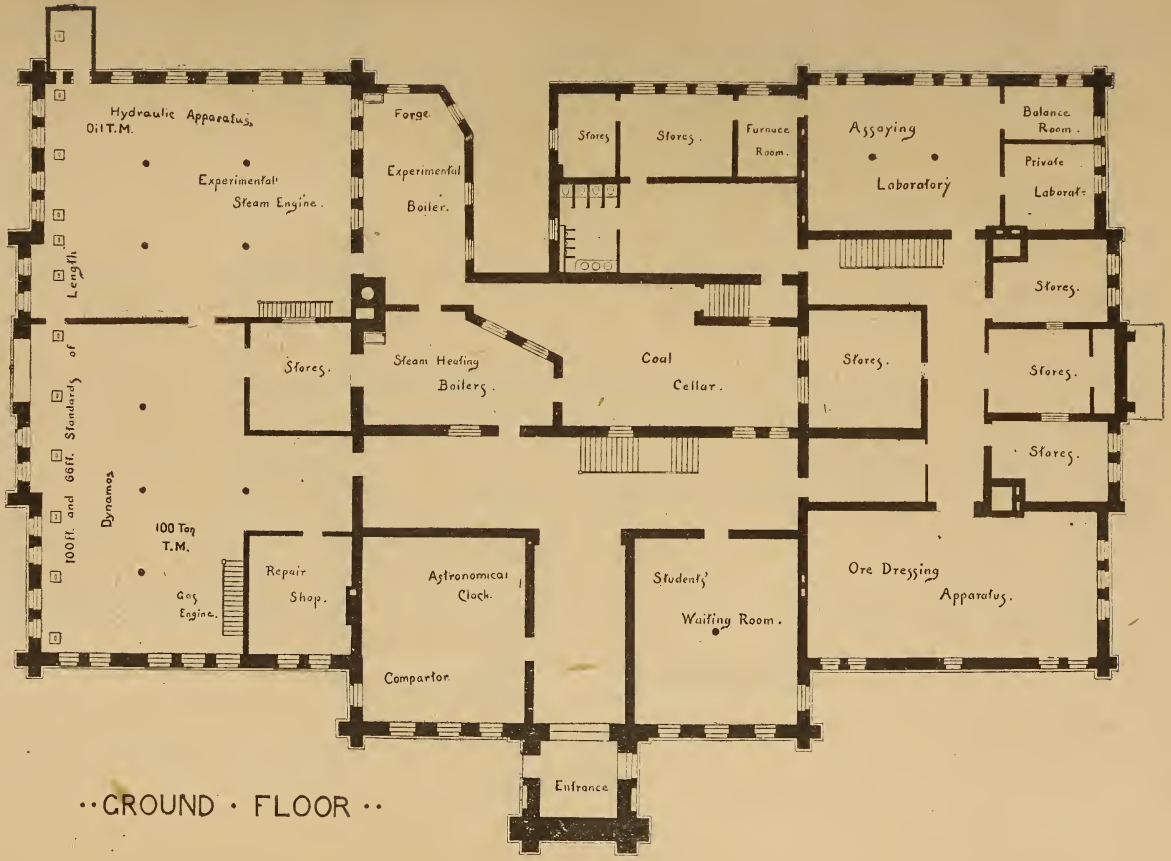
Honorary President	Mr. C. H. C. Wright.
President	C. E. Langley.
Vice-President	W. A. Lea.
Secretary-Treasurer	N. M. Lash.
Curator	*
Committee, 3rd year	C. Forester.
2nd year	H. Carroll.
1st year	*

This association has the supervision of the football, hockey and athletic sports in general.

*To be elected at beginning of coming year.



SCHOOL OF PRACTICAL SCIENCE, TORONTO.



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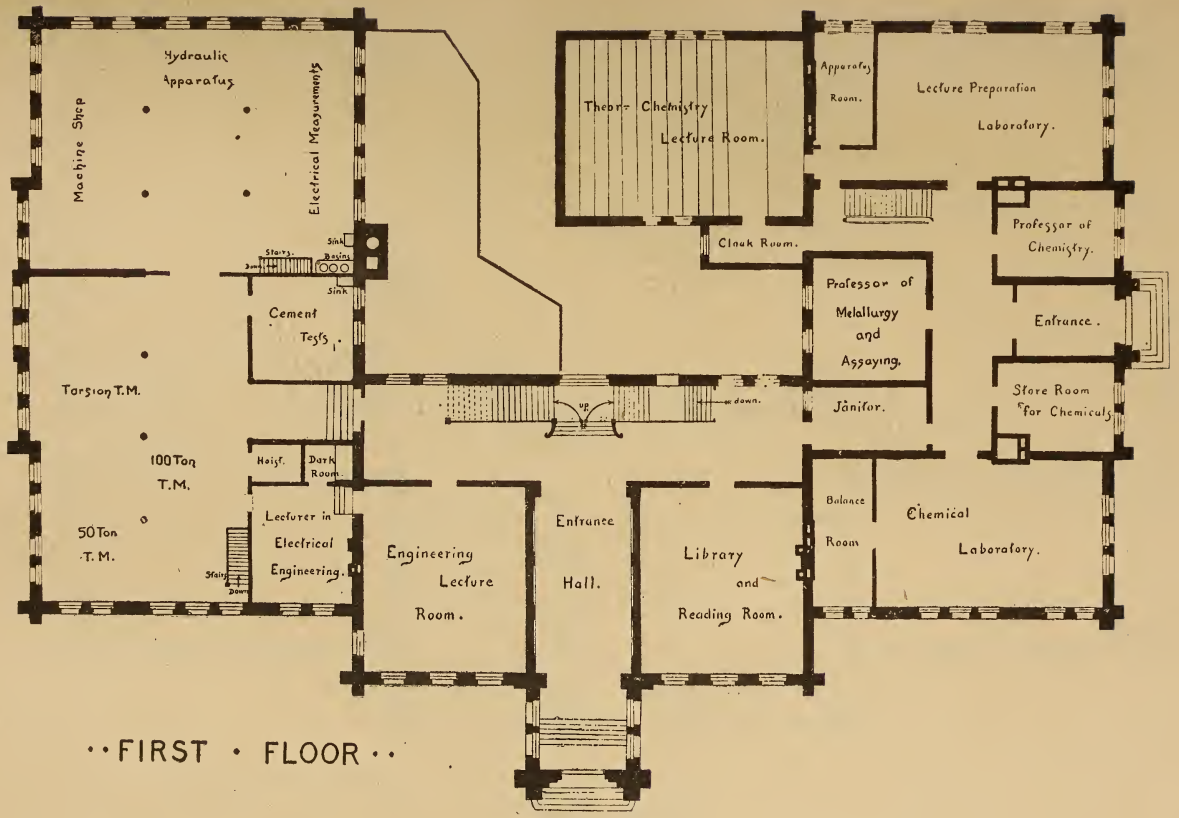
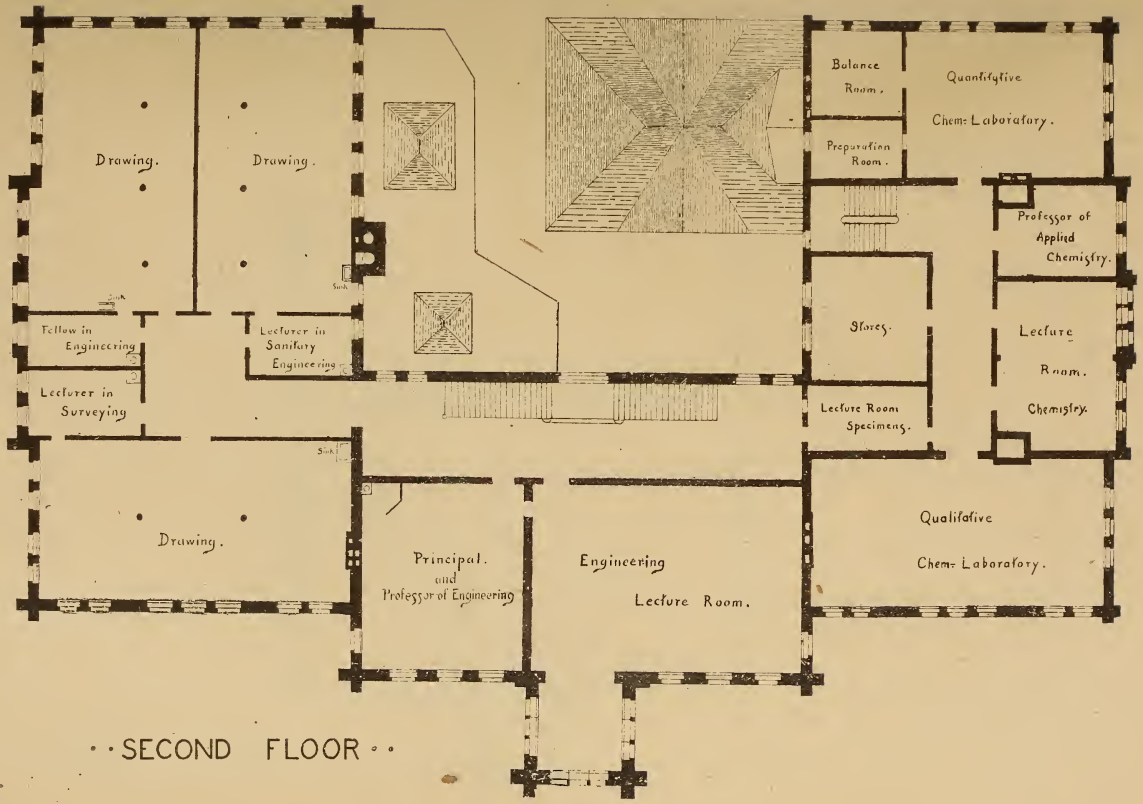

Hydraulic Apparatus
Machine Shop
Electrical Measurements
Stairs
Sink
Basins
Sink
Cement Tests
Torsion T.M.
100 Ton T.M.
50 Ton T.M.
Hoist.
Dark Room
Lecturer in Electrical Engineering.
Stairs Down
Engineering Lecture Room.
Entrance Hall.
Library and Reading Room.
Theor. Chemistry Lecture Room.
Apparatus Room.
Lecture Preparation Laboratory.
Cloak Room.
Professor of Metallurgy and Assaying.
Janitor.
up
down
Professor of Chemistry.
Entrance.
Store Room for Chemicals
Balance Room
Chemical Laboratory.

FIRST FLOOR


Drawing.
Drawing.
Sink
Sink
Fellow in Engineering
Lecturer in Sanitary Engineering
Lecturer in Surveying
Sink
Drawing.
Principal. and Professor of Engineering
Engineering Lecture Room.
Balance Room.
Quantitative Chem: Laboratory.
Preparation Room.
Professor of Applied Chemistry.
Stores.
Lecture Room. Chemistry.
Lecture Room Specimens.
Qualitative Chem: Laboratory.
SECOND FLOOR

Dais.
Assembly
Hall.
Museum.
Toxicological Laboratory.
Laboratory for Sanitary Chemistry.
Lecture Room Mineralogy and Geology.
Museum.
Architectural Lecture Room.
Drawing.
Lecturer in Architecture.

THIRD FLOOR

CALENDAR

OF THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and the Regulations for Diplomas.

15th Session, 1892-93.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1892.

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1892.

SEPTEMBER.

SUN.	MON.	TUE.	WED	THU.	FRI.	SAT.
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

23. Meeting of Council.
28. **Entrance Examinations** begin.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

1. **FIRST TERM** begins. Supplemental Examinations begin.
14. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

11. Meeting of Council.

1892-93.

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

9. Meeting of Council.
23. **FIRST TERM** ends.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

9. **SECOND TERM** begins.
13. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

10. Meeting of Council.
15. Ash Wednesday. Building closed.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	15	17	18
19	20	11	22	23	24	25
26	27	28	29	30	31	

10. Meeting of Council.
31. Good Friday. Building closed.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

10. Lectures and Practical Work close.
14. Meeting of Council.
17. **Examinations begin.**

MAY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

1. **SECOND TERM** ends.

TIME TABLE.—FIRST YEAR—SESSION 1892-3.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	Drawing.	Drawing.	*Conics.	Drawing	Drawing, 2, 3. Practical Chemistry, 1,4,5.	9-10
10-11	Drawing, 1, 3, 4, 5 ; 2, (*b*). *Electricity and Magnetism, 2, (*a*).	Drawing.	Drawing, 1, 3, 5. Electricity, 2. *Acoustics, 4 (*a*).	Drawing, 1, 3, 4, 5 ; 2, (*b*). *Electricity and Magnetism, 2, (*a*).	Drawing, 2, 3. Practical Chemistry, 1,4,5.	10-11
11-12	*Geometry and Trigonometry.	*Chemistry.	*Chemistry.	*Chemistry.	*Algebra.	11-12
12-1	Statics.	*Trigonometry.	Statics.	*Trigonometry.	Dynamics.	12-1
1-2						1-2
2-3	Descriptive Geometry.	Surveying (lecture), 1,2, 3, 4. Practical Chemistry, 5.	Drawing, 1, 4. Practical Chemistry, 2, 3, 5	Field Work, 1, 3, 4. *Physical Laboratory, 2, 5, (*a*). Drawing, 2, 5, (*b*).	Field Work, 1, 3. *Physical Laboratory, 2, 5, (*a*). Drawing, 2, 5, (*b*). Pen and Ink, 4.	2-3
3-4	Drawing, 1, 2, 3, 4. Practical Chemistry, 5.	Field Work, 1, 3, 4. Drawing, 2. *Physical Laboratory, 2 (*a*). Practical Chemistry, 5.	Drawing, 1, 4 Practical Chemistry, 2, 3, 5.	Field Work, 1, 3, 4. *Physical Laboratory, 2, 5, (*a*). Drawing, 2, 5, (*b*).	Field Work, 1, 3. *Physical Laboratory, 2, 5, (*a*). Drawing, 4 ; 2, 5, (*b*).	3-4
4-5	Drawing, 1, 2, 3, 4. Practical Chemistry, 5.	Field Work, 1, 3, 4 Drawing, 2. *Physical Laboratory, 2 (*a*). Practical Chemistry, 5.	Drawing, 1, 4. Practical Chemistry, 2, 3, 5.	Field Work, 1, 3, 4. *Physical Laboratory, 2, 5. (*a*). Drawing, 2, 5, (*b*).	Field Work, 1, 3. *Physical Laboratory, 2, 5, (*a*). Drawing, 4 ; 2, 5, (*b*).	4-5

1, Civil Engineering ; 2, Mechanical and Electrical Engineering ; 3, Mining Engineering ; 4, Architecture ; 5, Analytical and Applied Chemistry.
*University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments.

TIME TABLE.—SECOND YEAR—SESSION 1892-3.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	Strength of Materials, 1, 2, 3, 4.	*Astronomy, 1, 3. Theory of Mechanism, 2. History of Architecture, 4.	Strength of Materials, 1, 2, 3, 4.	*Astronomy, 1, 3. Theory of Mechanism, 2. Orders of Architecture, 4.	*Calculus.	9-10
10-11	Drawing, 1, (*a*). Electricity, 2, (*a*). Mining and Ore Dressing, 3, (*a*). Pen and Ink, 4, (*a*). *Optics, (*b*).	*Calculus. Drawing, 1, 2, 3, 4, (*a*). *Hydrostatics, (*b*).		Drawing, 1, 2, 4, (*a*). Mining and Ore Dressing, 3, (*a*). *Optics, (*b*).	Drawing. 1, 3, 4, (*a*). Electricity, 2, 5, (*a*). *Hydrostatics, (*b*).	10-11
11-12	Practical Mineralogy, 1, 3, 5. Drawing, 2 4.	Drawing.	Practical Chemistry.	Descriptive Geometry, 1, 2, 3, 4.	Drawing.	11-12
12-1	Practical Mineralogy, 1, 3, 5. Drawing, 2, 4.	Mineralogy and Geology, 1, 3, 4, 5. Drawing, 2.	Practical Chemistry.	Mineralogy and Geology, 1, 3, 4, 5.	Spherical Trigonometry, 1, 2, 3, 5. History of Ornament, 4.	12-1
1-2						1-2
2-3	Practical Mineralogy, 1, 3. Drawing, 4. Electrical Laboratory, 2, 5.	Applied Chemistry.	Rigid Dynamics, 1, 2, 3.	Applied Chemistry.	Theory of Surveying Instruments, 1, 3, 4. *Physical Laboratory, 2, 5, (*a*); 1, 3, 4, (*b*). Drawing, 2, (*b*).	2-3
3-4	Practical Mineralogy, 1, 3. Drawing, 4 Electrical Laboratory, 2, 5.	Field Work, 1, 3, 4. *Physical Laboratory, 1, 3, 4, (*b*). Drawing, 2.	*Physical Laboratory, 2, 5, (*a*). Drawing, 1, 3, 4.	Field Work, 1, 3, 4. *Physical Laboratory, 1, 3, 4, (*b*). Drawing, 2.	Field Work, 1, 3, 4. *Physical Laboratory, 2, 5, (*a*); 1, 3, 4, (*b*) Drawing, 2, (*b*).	3-4
4-5	Practical Mineralogy, 1, 3. Drawing, 4. Electrical Laboratory, 2, 5.	Field Work, 1, 3, 4. *Physical Laboratory, 1, 3, 4, (*b*). Drawing, 2.	*Physical Laboratory, 2, 5, (*a*). Drawing, 1, 3, 4.	Field Work, 1, 3, 4. *Physical Laboratory, 1, 3, 4, (*b*). Drawing, 2.	Field Work 1, 3, 4. *Physical Laboratory, 2, 5, (*a*); 1, 3, 4, (*b*). Drawing, 2, (*b*).	4-5

1, Civil Engineering ; 2, Mechanical and Electrical Engineering ; 3, Mining Engineering ; 4, Architecture ; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allott d are to be spent in the laboratories.

TIME TABLE.—THIRD YEAR—SESSION OF 1892-3.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	Theory of Compound Stress, 1, 2, 3, 4.	Hydraulics, 1, 2, 3, 4.	Descriptive Geometry, 1, 2, 3, 4.	Hydraulics, 1, 2, 3, 4.	Applied Chemistry.	9-10
10-11	Drawing, 1, 2, 3, 4.	Drawing, 4. Practical Astronomy, 1, 3. Machine Design, 2.	Drawing, 1, 2, 3, 4.	Drawing, 1, 4. Assaying, 3. Machine Design, 2.	Drawing, 2, 4. Practical Astronomy, 1, 3.	10-11
11-12	Drawing, 1, 2, 3, 4.	Practical Mineralogy, 1, 3. Drawing, 2, 4.	Drawing, 1, 2, 3, 4.	Drawing, 1, 2, 4. Assaying, 3.	Drawing, 1, 2, 4. Mining and Ore Dressing, 3.	11-12
12-1	Applied Chemistry. Metallurgy, 3.	Practical Mineralogy, 1, 3. Principles of Decoration, 4. Drawing, 2.	Mineralogy and Geology, 1, 3, 4. Electricity, 2.	Drawing, 1, 2. Assaying, 3. History of Architecture, 4.	Mineralogy and Geology, 1, 3, 4. Mechanics of Machinery, 2.	12-1
1-2						1-2
2-3	Constructive Design, 1, 3, 4. *Physical Laboratory, 2, (a). Drawing, 2, (b).	Thermodynamics, 1, 2, 3. Water Supply and Sewerage, 1, 4.	Constructive Design, 1,3,4. Drawing, 2.	Thermodynamics, 1, 2, 3. Water Supply and Sewerage, 1, 4.	Plumbing, Heating and Ventilation, 1, 4. Metallurgy, 3. *Physical Laboratory, 2, (a). Drawing, 2, (b).	2-3
3-4	Drawing, 1, 2, 3, 4. *Physical Laboratory, 2, (a).	Field Work, 1, 4. Assaying, 3. Electrical Laboratory, 2.	Drawing, 1, 2, 3, 4.	Field Work, 1. Assaying, 3. Electrical Laboratory, 2. History of Ornament, 4.	Field Work, 1, 4. *Physical Laboratory, 2, (a); 1, 4, (b). Drawing.	3-4
4-5	Drawing, 1, 2, 3, 4. *Physical Laboratory, 2, (a).	Field Work, 1, 4. Assaying, 3. Electrical Laboratory, 2.	Drawing, 1, 2, 3, 4.	Field Work, 1. Assaying, 3. Electrical Laboratory, 2. Drawing, 4.	Field Work, 1, 4. *Physical Laboratory, 2, (a); 1, 4, (b). Drawing.	4-5

1, Civil Engineering ; 2, Mechanical and Electrical Engineering ; 3, Mining Engineering ; 4, Architecture ; 5, Analytical and Applied Chemistry. *University of Toronto. (a) First Term. (b) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—FOURTH OR POST-GRADUATE YEAR.

There is no regular time table for the work of this year. The time of the students is spent almost wholly in the engineering, chemical, and assaying laboratories. The hours will be from 9 a.m. to 5 p.m. every working day during the session. Lectures will be given at such intervals as may suit the laboratory work.

Faculty of the School.

J. GALBRAITH, M. A., Assoc. M. Inst. C. E., Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., Assoc. M. Inst. C.E. ..... *Professor of Engineering (Chairman)*
W. H. ELLIS, M.A., M.B. ..... *Professor of Applied Chemistry.*
A. P. COLEMAN, M.A., Ph. D ..... *Professor of Assaying and Metallurgy*
L. B. STEWART, P.L.S., D.T.S. ..... *Lecturer in Surveying. (Secretary.)*
C. H. C. WRIGHT, Grad. S.P.S. ..... *Lecturer in Architecture.*
T. R. ROSEBRUGH, B.A., Grad. S.P.S. ..... *Lecturer in Electrical Engineering.*
CESARE J. MARANI, Grad. S.P.S. ..... *Lecturer in Sanitary Engineering.*

ASSISTANT INSTRUCTORS.

J. A. DUFF, B.A., Grad. S.P.S. ..... *Fellow in Engineering.*
R. W. ROSS, M.A. ..... *Fellow in Applied Chemistry.*
*——— ..... *Fellow in Metallurgy and Assaying.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

E. J. CHAPMAN, Ph.D., LL.D. ..... *Professor of Mineralogy and Geology.*
JAMES LOUDON, M.A. ..... *Professor of Physics.*
R. RAMSAY WRIGHT, M.A., B.Sc. ..... *Professor of Biology.*
W. H. PIKE, M.A., Ph.D. ..... *Professor of Chemistry.*
ALFRED BAKER, M.A. ..... *Professor of Mathematics.*
W. J. LOUDON, B.A. ..... *Demonstrator in Physics.*
A. B. McCALLUM, B.A., M.B., Ph.D. ..... *Lecturer in Physiology.*
W. L. MILLER, B.A., Ph.D ..... *Demonstrator in Chemistry.*
R. HENDERSON, B.A. ... } ..... *Fellows in Mathematics.*
J. F. HOWARD, B.A ... }
C. A. CHANT, B.A. ..... *Fellow in Physics.*
W. G. MILLER, B.A. ..... *Fellow in Mineralogy and Geology.*
E. C. JEFFREY, B.A. ..... *Fellow in Biology.*

For information further than that contained in the Calendar, application may be made to the Secretary, L. B. STEWART.

*To be appointed before 1st October, 1892.

School of Practical Science

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1892-93.

In the session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved of, the government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order in Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted :—

1. Civil Engineering (including Sanitary Engineering).
2. Mechanical and Electrical Engineering.
3. Mining Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also to give him such a training as will make him immediately useful when he enters into active professional work.

In order to afford an opportunity of taking full advantage of the engineering, chemical and assaying laboratories a fourth or post-graduate year has been established. In the regular three years course the laboratory and practical work is of such a nature that it can be successfully carried on in the intervals between lectures. All laboratory work which cannot be advantageously pursued in connection with a fixed time table for lectures has been reserved for the fourth year. The fourth year is thus essentially a laboratory year. Lectures are given in connection with the work as occasion requires. Graduates who fulfil the requirements of the fourth year are eligible for the degree of Bachelor of Applied Science (B.A.Sc.) University of Toronto. Graduates in the Department of Civil Engineering are also eligible for the degree of Civil Engineer (C.E.), University of Toronto, after three years of practical work.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour the Lieutenant-Governor in Council, the 14th day of June, 1892.

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1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be Chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma shall be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments :—

   (1) Civil Engineering (including Sanitary Engineering).

   (2) Mechanical and Electrical Engineering.

   (3) Mining Engineering.

   (4) Architecture.

   (5) Analytical and Applied Chemistry.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. Students may enter the Regular Course in any one of the above Departments either (*a*) by presenting certificates of having passed the Matriculation Examination in any University in Her Majesty's

Dominions or the High School Leaving Examination of the Province of Ontario, or (*b*) by presenting certificates of having had at least one year's experience in some recognized engineering, architectural or manufacturing work, and passing an examination in the following subjects :—

Algebra.—Elementary rules, easy factoring, highest common measure, lowest common multiple, square root, fractions, ratio, simple equations of one, two or three unknown quantities, indices, surds, quadratic equations of one and two unknown quantities.

Euclid—Books I, II, and III ; Deductions.

English—Dictation, Composition.

6. *The Council shall have the power of dealing with special cases provided the candidates are sufficiently prepared to take their places in the classes.

7. Special students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper.

8. Certificates of attendance and standing, may be given upon due examination to special students, and such students shall not be required to pass an entrance examination.

9. At the end of the Academic Year, examinations will be held in the different subjects taught. Candidates for Diplomas and Certificates are required to enter for these.

10. All regular students shall be in attendance at the school during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

11. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

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*The only examination held in the School of Practical Science for the purpose of testing qualification for entrance, is that mentioned in clause 5 (*b*). This examination will begin at 9 a.m. Wednesday, 28th September, 1892.

FORM OF DIPLOMA.

THE

SCHOOL OF PRACTICAL SCIENCE,

PROVINCE OF ONTARIO.

(ESTABLISHED 1878).

THIS IS TO CERTIFY *that*

.....

of the .....*in the* .....

..... *has completed the Regular Course of this School for the Diploma in the* .....

extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz. :

.....

.....

.....

WHEREFORE *the said* .....

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

..... *One thousand eight hundred and* .. ..

and have caused the seal of this School to be hereunto affixed.

.....*Chairman.*

L. S.]

.....*Secretary.*

REGULAR COURSES FOR THE DIPLOMA.

See regulations, pp. 9 and 10.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Sanitary Engineering).
(2) Mechanical and Electrical Engineering.
(3) Mining Engineering.
(4) Architecture.
(5) Analytical and Applied Chemistry.

SESSIONAL AND OTHER FEES, DEPOSITS, ETC.

The sessional fees for instruction in any of the regular courses, are as follows .—

First Year : Thirty-four Dollars.
Second Year : Forty-four Dollars.
Third Year : Fifty-four Dollars.

These are payable in two equal instalments, one in each term. A discount of two dollars will be made on each instalment if paid before the end of the first month of the term in which it is due. There is no extra fee for the Diploma.

Deposits.

General	$2 00
Chemical laboratory	3 00
Mineralogical laboratory	7 00

Dues.

For maintenance of Physical Laboratory.

Departments.	I. Year.	II. Year.	III. Year.
	$ c.	$ c.	$ c.
Civil and Mining Engineering	.....	1 50	1 00
Mechanical and Electrical Engineering	1 00	1 50	3 00
Architecture	.....	1 00	2 00

The discount on the instalment of sessional fees payable in the first term will not be allowed unless all deposits and other dues are paid at the same time.

ESTIMATED EXPENSES OF A REGULAR COURSE.

Sessional Fees	$120 00
Books, instruments, drawing materials, laboratory fees, etc., about as follows— I. Year, $60 ; II. Year, $40 ; III. Year $30....	130 00
Total for Regular Course about	$250 00

Information as to instruments and materials will be given to the students on registration at the beginning of the Session.

FELLOWSHIPS.

Three fellowships, one in Engineering, one in Applied Chemistry, and one in Metallurgy and Assaying have been established, open to graduates of the school.

Each fellowship is of the value of $500 per annum.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respective Years and Departments :—

Subject.	Civil and Mining Engineering.			Mechanical and Electrical Engineering.			Architecture.		
	I Year.	II Year.	III Year	I Year.	II Year.	III Year.	I Year.	II Year.	III Year.
Applied Mechanics..	8	6	8	10	15	12	8	5	6
Descript. Geometry.	7	12	11	11	7	10	7	9	10
Surveying	6	4	4	0	0	0	2	0	0
Architecture	0	0	0	0	0	0	7	9	7

The above minimum number of drawings will include only such drawings as shall be specially prescribed for the purpose.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned minimum number of drawings must be made, together with as many practice sheets as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The minimum number of drawings shall be 25 and the maximum number 35.

The drawings must be made on paper 15x22 inches, unless otherwise prescribed.

At the end of each term the drawings must be neatly bound together between covers of approved pattern before they are finally examined, and the student's name, together with his year, term, and date, must be neatly printed on said cover.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the school without permission.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

No field notes will be counted, which have not been taken in the field, and during the hours allotted to such work.

The penalties for the infringement of the above two rules will be determined in each case by the Council.

Vacation Work.

Vacation work must be handed in during the first week of the ensuing session, otherwise it will not be counted.

Vacation notes must be on construction only, and consist of not less than 20, nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap, and consist of not less than 20, nor more than 30 pages.

The minimum percentage of marks required for practical work must be made in the case of vacation notes and theses.

No notes, whether taken during the session or the vacation, will be counted unless made in the standard note books of the School.

Theses must be accompanied by carefully made drawings and illustrations separated from the text, and must be bound between flat covers.

The sketches for the second year thesis in the Architectural Course are to be made on one side of the sheet of a sketch book and mounted on cardboard or paper 15″ x 22″.

The Architectural students are advised to spend the vacation in an architect's office.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations will begin on the first day of the session.

In the case where a candidate fails to pass a supplemental examinations it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year, will be the regular fees for such year.

Students are required to spend the hours of every working day between nine a.m. and five p.m. at the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted, unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

PRIZES.

Through the liberality of Mr. D. B. Dick, Architect, Toronto, a prize of $10.00 in books will be open annually for competition in the first year of the Architectural Department.

REGULAR EXAMINATIONS.

(Approximate List.)

DEPARTMENTS OF CIVIL ENGINEERING, MECHANICAL AND ELECTRICAL ENGINEERING, MINING ENGINEERING, AND ARCHITECTURE.

I. Year.

Examinations held at end of Session.

Algebra.
Euclid.
Plane Trigonometry.
Analytical Geometry.
‡History of Architecture.
†Magnetism and Electricity.
Statics.
Dynamics.
Descriptive Geometry.
Surveying.
Chemistry, Elementary.
†Electricity.

Examinations held during the Session.

Drawings.
*§Field Notes.
Construction Notes.
†Experimental Physics.
Practical Chemistry.

II. Year.

Examinations held at end of Session.

Calculus.
*§Astronomy.
Optics.
Strength of Materials.
*†§Rigid Dynamics.
†Theory of Mechanism.

*Civil Engineering only.
§Mining Engineering only.
†Mechanical and Electrical Engineering only.
‡Architecture only.

Hydrostatics.
†Magnetism & Electricity.
‡History of Architecture.
‡Orders of Architecture.
‡History of Ornament.
Chemistry, Theoretical.
Chemistry, Applied.
Descriptive Geometry.
§‡*Surveying.
§*†Spherical Trigonometry.
§‡*Mineralogy and Geology.
†Electricity.
§Metallurgy.
§Mining.

Examinations held during the Session.

Drawings.
§*Field Notes.
Construction Notes.
Experimental Physics.
Thesis (at beginning of Session).
Chemistry, Practical.
§*Mineralogy, Practical.

III. Year.

Examinations held at end of Session.

†Magnetism and Electricity.
‡History of Architecture.
‡History of Ornament.
‡Principles of Decoration.
Method of Least Squares.
Chemistry, Applied.
§‡*Mineralogy and Geology.
‡*Water Supply and Sewerage.
‡*Sanitary Plumbing, Heating and Ventilation.
Metallurgy.
§Mining and Ore Dressing.
Theory of Compound Stress.
§‡*Theory of Construction.
†Mechanics of Machinery.
†Machine Design.
Hydraulics.
§†*Thermodynamics.
Descriptive Geometry.
§*Practical Astronomy and Geodesy
§‡*Surveying and Levelling.

Examinations held during the Session.

Drawings.
§*Field Notes.
Construction Notes.
xperimental Physics.
Thesis (at beginning of Session).
§*Mineralogy, Determinative.
§Assaying.

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*Civil Engineering only.
§Mining Engineering only.
†Mechanical and Electrical Engineering only.
‡Architectue only.

I. DEPARTMENT OF CIVIL ENGINEERING.

(Including Sanitary Engineering.)

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Sanitary Engineers).

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to Structures and Machines).

DRAWING.

Copying from the flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus,
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

EXPERIMENTAL PHYSICS.

Light : Use of lenses and mirrors. Calculation of focal lengths. The prism and spectroscope. Goniometer and heliostat.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and Structures. (Drawings made from both copies and original notes).

ENGINEERING AND SURVEYING.

Statics and Dynamics. (Pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, Curves, etc.
Hydrographic Surveying.

CHEMISTRY.

General Chemistry.
Practical Chemistry.
Chemistry (Applied).
Combustion, Fuel, and Furnaces.
Artificial Lighting.
Photography.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

III. YEAR.

EXPERIMENTAL PHYSICS.

Heat : Specific Heat. Latent Heat. Expansion of Air, Air Thermometer. Method of Least Squares.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

ENGINEERING AND SURVEYING.

Statics and Dynamics. (Pure and applied.)
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
Bridges, Roofs, Floors.
Arches, Retaining Walls.
Foundations, etc.
*Thermodynamics and Theory of the Steam Engine.
Hydraulics.
*Drainage, Sewerage, Water Supply, Sanitary Plumbing, Heating and Ventilation.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross-sections, Field work and Plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a sphere).
Practical Astronomy (treated in the manner required for the P.L.S. and D.L.S. Examinations.)

CHEMISTRY (APPLIED).

Explosives.
Mortars and Cements.
Bricks and Artificial Stones.
Preservation of Wood, Iron and Stone.
¶Water, Air and Sewage, with Laboratory work.

METALLURGY.

Metallurgy of Iron and Steel.

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*Only one of these subjects to be taken.
* Civil Engineering only. ¶Sanitary Engineering only.

MINERALOGY AND GEOLOGY.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

II. DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to Structures and Machines).

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light : Use of Lenses and Mirrors.
Calculation of focal lengths.
The Prism and Spectroscope.
Goniometer and Heliostat.

DRAWING.

Copying from the Flat, Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

(Lectures only). Applications of Trigonometry and Principles of Measurement.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat. Latent Heat.
Expansion of Air. Air Thermometer.
Electricity and Magnetism:
Calculation of Elements of Terrestrial Magnetism.
Declination, Dip, and Horizontal Intensity.
Tangent Galvanometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers.

DRAWING.

Subjects of first year continued.
Coloring and Shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and Structures. (Drawings made from both copies and original notes).

ENGINEERING.

Statics and Dynamics (Pure and Applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials and Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

CHEMISTRY.

Theoretical Chemistry.
Practical do
Applied do
Combustion, Fuel and Furnaces.
Artificial Lighting,
Photography.

III. YEAR.

EXPERIMENTAL PHYSICS.

Electric Light Photometry,
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.
Method of Least Squares.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry :
Shades and Shadows.
Stone Cutting.
Perspective Projection.

ORIGINAL DESIGNS.

Engine and Machine Design.

ENGINEERING.

Subjects of previous years continued.
Applied Mechanics :
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.

Electricity :
Dynamos and Motors.
Application of principles to practical problems connected with the design, construction and testing of various prime motors and machines.
Experimental work in Engineering Laboratory.

CHEMISTRY (APPLIED).

Explosives.
Preservation of Wood, Iron and Stone.

METALLURGY.

Iron, Steel, Nickel, Copper, etc.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical and Electrical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam-engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

III. DEPARTMENT OF MINING ENGINEERING.

This Department is designed to afford the necessary preliminary training to students intending to become Mining Engineers.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

DRAWING.

Copying from the flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids. Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography — Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Geometrical Optics.
Plane Astronomy.

EXPERIMENTAL PHYSICS.

Light : Use of Lenses and Mirrors.
Calculation of focal lengths.
The Prism and Spectroscope.
Goniometer and Heliostat.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and Structures. (Drawings made from both copies and original notes.)

ENGINEERING AND SURVEYING.

Statics and Dynamics. (Pure and applied.)
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Mining Surveying.

CHEMISTRY.

General Chemistry.
Practical Chemistry, including qualitative and quantitativ analysis.
Chemistry (Applied.)
Combustion, Fuel, and Furnaces.
Artificial lighting.
Photography.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

METALLURGY.

Iron and Steel.
Mining and Ore Dressing.

III. YEAR.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat. Latent Heat.
Expansion of Air, Air Thermometer.
Method of Least Squares.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

ENGINEERING AND SURVEYING.

Statics and Dynamics. (Pure and applied.)
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
Bridges, Roofs, Floors,
Arches, Retaining Walls.
Foundations, etc.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross-sections, field work and plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a Sphere.)
Practical Astronomy (treated in the manner required for the P.L.S. and D.L.S. Examinations.)

CHEMISTRY (APPLIED.)

Explosives.
Mortars and Cements.
Bricks and Artificial Stones.
Preservation of Wood, Iron and Stone.
Qualitative and Quantitative analysis.

MINERALOGY AND GEOLOGY.

Economic Geology.
Palæontology.
Blowpipe Analysis and Determinative Mineralogy.
Metallurgy of Gold, Silver, Nickel, Copper, etc.
Mining and Ore Dressing continued.
Assaying.

IV. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

MECHANICS.

Statics (with reference to Structures).
Dynamics (preliminary to the study of Hydraulics).

PHYSICS.

Acoustics.

DRAWING.

Instrumental and Free-hand, Copying from the Flat, Lettering, Pen and Ink, Descriptive Geometry (Plane Surfaces).

HISTORY OF ARCHITECTURE.

Egyptian, Assyrian and Persian.

SURVEYING.

Principles, Chain Surveying, Mensuration.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.

PHYSICS.

Hydrostatics, Optics.

EXPERIMENTAL PHYSICS.

Light : Use of Lenses and Mirrors.
Calculation of Focal Lengths.
The Prism and Spectroscope.
Goniometer and Heliostat.
Acoustics : Laws of Vibrating Strings.
Determination of Pitch.
Velocity of Sound.
Electric Fork.
Chronograph.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching an Water Color, Pen and Ink.
Descriptive Geometry (Curved Surfaces).

SURVEYING.

Use of Transit and Level.
Mensuration.

MECHANICS.

Statics (Pure and Applied.)
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory.

HISTORY OF ARCHITECTURE.

Greek and Roman.
Romanesque and Byzantine.

ORDERS AND ELEMENTS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

Ancient.
Classic—Greek, Roman.

CHEMISTRY.

General Chemistry.
Practical do
Applied do
Combustion, Fuels and Furnaces.
Artificial Lighting.
Photography.

MINERALOGY AND GEOLOGY.

Elements.

III YEAR.

DRAWING.

Descriptive Geometry.
Shades and Shadows.
Perspective.
Stone Cutting.
Water Color Sketching.
Original Designs—Floors, Trusses, Arches, etc.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

EXPERIMENTAL PHYSICS.

Specific Heat, Latent Heat.
Expansion of Air, Air Thermometer.
Method of Least Squares.

HISTORY OF ARCHITECTURE.

Gothic and Renaissance, with special reference to England.

HISTORY OF ORNAMENT.

Early Christian, Gothic and Renaissance.

PRINCIPLES OF DECORATION.

CHEMISTRY (APPLIED).

Artificial Lighting, Photography, Mortars and Cements, Bricks, and Artificial Stone.
Preservation of Wood, Iron and Steel.
Water, Air, and Sewage.

THEORY OF CONSTRUCTION.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.
Experimental work in Engineering Laboratory.

MINERALOGY AND GEOLOGY.

Economic Geology.

V. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists or industrial chemists, and also to furnish instruction in chemistry and its useful applications, to students of engineering and architecture, and to special students who may desire such instruction.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry, Plane Analytical Geometry.

MECHANICS.

Statics and Dynamics.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of Lenses and Mirrors.
Calculation of Focal Lengths.
The Prism and Spectroscope.
Goniometer and Heliostat.

DRAWING.

Copying, Lettering, Model drawing.
Descriptive Geometry.

MODERN LANGUAGES.

French.
German.

CHEMISTRY.

Inorganic Chemistry.
Laboratory Work.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat. Latent Heat. Expansion of Air, Air Thermometer.
Electricity and Magnetism.
Calculation of Elements of Terrestrial Magnetism.
Declination, Dip and Horizontal Intensity.
Tangent Galvanometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers.

MODERN LANGUAGES.

French.
German.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

CHEMISTRY.

Organic Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

III. YEAR.

PHYSICS.

Thermodynamics.
Electrical Measurements.
Electric Light Photometry.
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.
Method of Least Squares.

BIOLOGY.

PHYSIOLOGY.

MINERALOGY AND GEOLOGY.

CHEMISTRY.

Advanced Chemistry, Inorganic and Organic.
Applied Chemistry.
Laboratory work.

THE FOURTH YEAR.

In order to provide advanced work in the various departments and also to enable students to carry on experimental work in the laboratories with less interruption from attendance at lectures and other causes than is possible in the ordinary three years course, it has been decided to establish a sessional course of instruction in each department to be known as the fourth year.

The diploma of the school will be given, as heretofore, to all candidates who fulfil the requirements of the ordinary three years course, and an extra certificate will be given to candidates who after having fulfilled the requirements of the three years course may succeed in properly qualifying themselves in the work of the fourth year.

The work for the Fourth Year Certificate is as follows :—

CIVIL ENGINEERING.

The work in this Department is divided into two groups between which an option must be exercised.

Group I.

The principal subjects of this group are :-

Method of Least Squares.
Theory of Observations.

Strength and Elasticity of Materials.
Mortars and Cements.
Hydraulics.
Thermodynamics.
Engineering Designs.

The work in connection with these subjects will be done principally in the engineering laboratory, which is supplied with various machines, apparatus, and instruments necessary for experimental investigation.

Group II.

The subjects of this group are :—

Method of Least Squares.
Theory of Observations.
Topographical Surveying with Transit, Stadia, Micrometers, Plane Table, etc.
Practical Astronomy (extended to cover the D.T.S. examinations with special reference to the theory of astronomical instruments).
Advanced Geodesy.

In the basement of the school are laid out a 100 ft. and a 66 ft. standard of length arranged so that various conditions affecting the length of surveyors' chains and tapes may be thoroughly investigated. Candidates will be required to take part in such work,

The school is also equipped with some of the more important instruments used in spherical and geodetic surveying.

Mechanical and Electrical Engineering.

The subjects in this department are :—

Method of Least Squares.
Theory of Observations.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics.
Electricity.
Engine and Machine Design.

A great part of the work in connection with the above subjects will be done in the engineering laboratory. The time of the candidates will be principally devoted to tests in connection with boilers, engines, dynamos and electric motors.

MINING ENGINEERING.

The subjects in this department are :—

Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics.
Electricity.
Advanced Mineralogy, including Crystallography.
Microscopic Lithology.
Assaying and Mineral Analysis.
Metallurgy.

ARCHITECTURE.

The subjects in this department are :—

Water-color Sketching.
Perspective.
Stereotomy.
Hydraulics.
Strength and Elasticity of Materials.
History of Architecture.
Design.
Specifications.

The laboratory work will consist of tests of the strength and elasticity of wood, iron and steel and of a course in cement and mortar testing.

ANALYTICAL AND APPLIED CHEMISTRY.

Students of the fourth year may select either of the following courses :

(*a*) Industrial Chemistry :
With Laboratory work in General and Technical Analysis.

(*b*) Sanitary and Forensic Chemistry :
With Laboratory practice in Toxicology, and the Analysis of Food, Water and Air.

(*c*) Inorganic and Organic Chemistry.

Graduates of the University of Toronto in the department of Chemistry and Mineralogy will be admitted to the Fourth Year in Analytical and Applied Chemistry and Mining and Metallurgy.

In all departments the candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested by their ability to translate extracts from scientific works or periodicals not previously specified.

Courses of reading in connection with subjects of study will be indicated in each Department.

The fee for the Fourth Year is $54.00, subject to the conditions as to discounts, etc., stated on page 12.

DEGREE OF B. A. Sc.

Candidates who have fulfilled the requirements of the Fourth Year in the School of Practical Science are eligible for the degree of Bachelor of Applied Science in the University of Toronto in accordance with the following statute passed by the Senate in 1892.

By the Senate of the University of Toronto.

Be it enacted :

That the degree of Bachelor of Applied Science (B. A. Sc.) be hereby established to be granted subject to the following conditions and regulations :—

1. Candidates for the said degree shall hold the diploma of the School of Practical Science in any one of the regular courses of the said School, or shall be of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy in the University of Toronto.
2. They shall have fulfilled the conditions relating to the Fourth or Post-Graduate Year in the School of Practical Science and shall present certificates of having done so to the Registrar of the University.
3. Each candidate shall prepare a Thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University examiners. This thesis is to be accompanied by all necessary drawings, specifications, tables and estimates.
4. Candidates will be required to pass such written and oral examinations as may be prescribed by the University Examiners in any two of the following subjects :—

   Method of Least Squares and Theory of Observations.
   Practical Astronomy.
   Geodesy.
   Strength and Elasticity of Materials.
   Hydraulics.
   Thermodynamics and Theory of Heat Engines.
   Electricity and Magnetism.
   Industrial Chemistry.
   Sanitary and Forensic Chemistry.

Inorganic and Organic Chemistry.
Mineralogy and Geology.
Metallurgy and Assaying.
History of Architecture.

5. Candidates shall notify the Registrar of their intention to proceed to the degree of B.A.Sc. not later than the first day of April.

6. The examination for the degree shall be held in May.

7. The fee for the degree shall be ten dollars and shall be paid to the Registrar not later than the first day of May.

8. The ordinary time for conferring the degree shall be at the University commencement in June. The degree may be conferred at any meeting of the Senate.

9. The thesis, drawings, and other papers accompanying them, shall be the property of the University.

10. In case any change be made in the conditions referred to in the second clause, such change shall be submitted to the Senate and shall have no force so far as the said clause is concerned unless approved by resolution of the Senate.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and Survey of Lands.

"12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study, of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of

having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service ; or, in case he has received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

"(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

"14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements. he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

"Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service ; but it shall rest with the board to decide whether the course of instruction in such College or University is that required by this clause.

The attention of the Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facillties afforded for preparation in the School.

DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884 :—

BY THE SENATE OF THE UNIVERSITY OF TORONTO.

Be it enacted :

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C.E. be hereby established, to be granted subject to the following conditions and regulations :—

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.
2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.
3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.
4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.
5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.
6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates ; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.
7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate not later than the first day of February.
8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.
9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.
10. The examination of the essay, drawings end estimates and any further examination of the candidate that may be considered necessary, may be held in May.
11. The fee for the degree of C.E. shall be $20, and shall be paid to the Registrar not later than the first day of May.
12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.

Synopsis of the Courses of Lectures

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT.

With Fees for Special Students.

The same discount for prompt payment will be allowed as in the case of regular students. *See p. 12.*

Special students are advised to enter at the beginning of the session (October 1st), as many subjects begun in the first term are continued through the second, and lectures cannot be repeated.

(Reductions will be made to special students taking several courses.)

☞Text-books for the first year marked (*a*) ; for second year (*b*) ; for third year (*c*), and for fourth year (*d*).

DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid) ; Orthographic, Oblique and Perspective Projections ; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference,—Davidson's Projections.
Angel's Plane and Solid Geometry.
Binn's Orthographic Projection.
Millar's Descriptive Geometry, (*a*), (*b*).
Warren's Stone Cutting (*c*).
McCord's Lessons in Mechanical Drawing.
Worthen's Topographical Drawing, (*a*), (*b*), (*c*).

Fees for Special Students, $14.

SURVEYING AND LEVELLING.

LAND SURVEYING.

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING.

Longitudinal and Cross Sections.
Plotting.

SETTING OUT.

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION.

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text-Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*), (*d*).
Henck's or Trautwine's Railway Curves (*b*), (*c*).
Johnson's Theory and Practice of Surveying.

Fées for Special Students, $14.

PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE.

The work included in this course is sufficient to fulfil the requirements of the final examinations for Provincial and Dominion land surveyors.

In astronomy the principal subjects are the determination of time, latitude and azimuth, and the general principles of the methods of determining longitudes. Practical instruction is given in the methods of taking observations.

In geodesy all surveys, computations and methods of map construction are based upon the supposition that the earth is a sphere.

ADVANCED COURSE (FOURTH YEAR).

The work in this course is intended to fulfil the requirements of the final examination for Dominion topographical surveyors. It is distinguished from the work in the ordinary course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In geodesy the earth is considered as a spheroid.

Text-Books.—Gillespie's Higher Surveying (*b*), (*c*).
Greene's Spherical and Practical Astronomy (*c*), (*d*).
Chauvenet's Spherical and Practical Astronomy.
Gore's Elements of Geodesy (*c*), (*d*).
Nautical Almanac, 1893 (*c*), (*d*).

Fee for Special Students, $19.

APPLIED MECHANICS.

STATICS.

The calculation of the stresses in framed structures, solid and riveted beams, arches, etc. Both graphical and analytical methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS.

THEORY OF COMPOUND STRESS.

DESIGNING OF STRUCTURES in timber, iron and masonry—arches, retaining walls, foundations, roofs, bridges, etc.

DYNAMICS.

Representation and measurements of forces and motions.
Principles of *work* and *energy*.
Efficiency of machines. Friction.
Transmission of energy—belts, shafts, crank and connecting rod, etc.
Fly-wheels, governors.
Balancing of machinery, etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS—

Discharge of water through orifices, notches, etc. Flow in pipes and open channels. Water power. Water wheels, turbines, pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE.

Text Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
Du Bois—Graphic Statics.
" Strains in Framed Structures.
Cotterill—Applied Mechanics (*a*), (*b*), (*c*), (*d*).
Rankine—Applied Mechanics (*b*), (*c*), (*d*).
Unwin—Elements of Machine Design (*c*).
Shann — Elementary Treatise on Heat (*c*), (*d*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Merriman—Hydraulics (*c*), (*d*).
Jackson—Hydraulic Manual.
Gerhard—House Drainage and Sanitary Plumbing (*c*).
Santo Crimp — Sewage Disposal Works.

Fees for Special Students, $19.

THEORY OF MECHANISM.

Principles of the transmission of motion without reference to force.

Pitch surfaces, spur wheels, bevel wheels, skew-bevel wheels, trains of wheelwork, teeth of wheels, cams, cranks, eccentrics, links, bands and pulleys, hydraulic connections, frictional gearing, link motion for slide valves, etc., etc.

Text-Books and Books of Reference.—Rankine—Machinery and Millwork.
Camus—Teeth of Wheels.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Cotterill—Applied Mechanics (*b*), (*c*), (*d*).

Fee for Special Students, $19.

ELECTRICITY.

Instruction will be given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University. The work will comprise :—

ELEMENTARY ELECTRICITY AND MAGNETISM.

MEASURING INSTRUMENTS—

Theory and uses in determining current, electromotive force, resistance, capacity, strength of field, magnetic inductance, etc., etc.

MATHEMATICAL THEORY OF ELECTRICITY.

APPLICATIONS OF ELECTRICITY—

Laboratory work and lectures on telegraph, telephone, dynamos, their design and construction, electric lighting ; arc and incandescent systems, storage batteries, transmission of power by electricity, etc.

THEORY OF ALTERNATING CURRENT GENERATORS AND TRANSFORMERS.

Text-Books and Books of Reference.—Kennelly & Wilkinson—Practical Notes for Electrical Students (*a*). (*b*).
Stewart & Gee—Practical Physics (*b*)

Cumming—Theory of Electricity (*c*).
Thomson, S. P.—Dynamo Electric Machinery (*c*), (*d*).
Kapp—Electric Transmission of Energy (*d*).
Blakesley—Alternating Currents (*d*)

Current numbers of the "Electrician," the "Electrical World," and "La Lumiere Electrique."

Fee for Special Students, from $19 to $34.

ARCHITECTURE.

History of Architecture—

Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

Orders of Architecture.

History of Ornament.

Principles of Decoration.

Text-Books and Books of Reference.—T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Fergusson's History of Architecture.
Gwilt's Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture (*b*), (*c*).
Leed's Orders of Architecture (*b*).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.

Fee for Special Students, $19.

MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the School.

CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES BY THE PROFESSOR OF CHEMISTRY OF THE UNIVERSITY OF TORONTO.

Inorganic Chemistry.
Organic Chemistry.
Historical Development of Chemical Theory.
Physical Chemistry.

COURSES BY THE PROFESSOR OF APPLIED CHEMISTRY OF THE SCHOOL OF PRACTICAL SCIENCE.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuel, Furnace, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air and Sewage, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis Food, Water and Air, and Toxicology.

Fee for Special Students, $34 to $54.

MINERALOGY AND GEOLOGY.

MINERALOGY, GEOLOGY, MINING AND METALLURGY.

1. Mineralogy and Geology—
   Mineralogy and Crystallography.
   Geology and Palæontology.
   Lithology.
   Physical Geography.
   Blowpipe Analysis.
   Determinative Mineralogy.

Books of Reference.—Chapman's Mineralogy and Geology of Canada.
Dana's Manual of Geology.
Dana's System of Mineralogy.
Nicholson's Palæontology.
Geikie's Text-Book of Geology.
Plattner's Manual of Blowpipe Analysis.
Chapman's or Brush's Mineral Tables.

2. Mining and Metallurgy—

Mining Geology.
Ore Dressing.
Metallurgy of Iron and Steel.
Metallurgy of Nickel, Copper, Silver, etc.
Assaying.

Köhler's Bergbaukunde.
Kuhnhardt's Ore Dressing.
Phillip's Ore Deposits.
Balling's Metallhuettenkunde.
Schnabel's Allgemeine Huettenkunde.
Phillip's and Bauerman's Elements of Metallurgy.
Mitchell's Assaying by Crookes.
Kerl's Probirkunst.

Fee for Special Students, $19 to $54.

VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a thesis (accompanied by drawings and specifications when necessary) during the subsequent vacation.

The engineering and architecture students will also be required to make, during the vacation, full and clear notes of various constructions that may fall under their notice.

The value of both the thesis and the construction notes will be taken into account in determining his standing at the next following examination.

Civil Engineering.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.

Books of Reference.—Gilmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Mechanical and Electrical Engineering.

Subject of Thesis for Second Year.—Machine-shop Practice.
" " *Third* " Foundry Practice.

Books of Reference.—Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

Architecture.

For the second year the following set of freehand pencil sketches will be required :—

I. Doorway from the object ;
II. Staircase " "
III. Arched bridge (stone) from the object ;
And seven sheets from the object, prints or drawings, with plans and sections where possible.

Subject of the Thesis for the Second Year.—The above sketches.
" " *Third* Sanitary Drainage.

Books of Reference for Third Year.—Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Any other works on the above subjects may be consulted and results of original observations should be given.

ENGINEERING LABORATORY.

This Laboratory occupies two floors, having a total area of 10,000 square feet. It consists of three departments, viz. :

(*a*) The department for testing materials of construction.

(*b*) The department for investigating the principles governing the applications of power. This department is sub-divided into the steam laboratory, the hydraulic laboratory and the electrical laboratory.

(c) The department for investigating problems connected with standards of length, time, astronomical observations, etc.

In order to prepare specimens for the testing machines, a shop has been fitted up with a number of high-class machine tools specially suited for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labor. It is also supplied with the necessary appliances for making ordinary repairs.

The machines in the department for testing materials are the following :—

An Emery 50-ton machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A Riehle 100-ton machine for making tests in tension, compression, shearing and cross-breaking. It will take in posts twelve feet long and beams up to eighteen feet in length.

An Olsen torsion machine for testing the strength and elasticity of shafting. This machine will twist shafts up to sixteen feet in length and two inches in diameter.

A Riehle 2,000 pounds cement testing machine. The cement testing room is fitted with all the usual accessories.

The equipment of the power department is as follows :—

A Babcock & Wilcox 52-horsepower boiler.

A Harrison Wharton 12-horsepower boiler.

A 50-horsepower Brown engine. This engine was constructed specially for experimental investigation. It is steam jacketted and has three alternative exhausts, to the open air, to a jet condenser, and to a Wheeler surface condenser, kindly presented to the School by Mr. F. M. Wheeler of New York, the inventor.

There are also a Blake circulating pump, a Knowles air pump and a Blake feed pump, the latter of which was a gift from the manufacturers.

A machine for testing lubricating oils and measuring journal friction, built by Riehle Bros., of Philadelphia.

The hydraulic division of the laboratory is furnished with a three-throw pump with double acting cylinders. It has a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices and weirs, measuring tanks, etc. A three feet jet turbine forms a part of the same equipment.

The electrical division of the laboratory is equipped with the following dynamos :—

Edison, Ball, Thomson-Houston, two Gülcher machines, a Westinghouse alternator with transformers, a Crocker-Wheeler and a Kay motor, also two small fan motors.

There are also a Roberts storage battery, a gravity primary battery and a good equipment of lamps, are and incandescent, of different types.

The power department is equipped with the usual measuring instruments, indicators, gauges, gauge testing apparatus, scales, brakes, dynamometers, a variety of electrical measuring apparatus, including a Thomson electrical balance.

The shafting is driven by a 7-horsepower Otto gas engine, and by the Brown engine above described.

In the geodetic and astronomical department are a 100 feet and a 66 feet standard of length ; a 10 foot Rogers comparator with graduating attachment ; a Howard astronomical clock and electro-chronograph ; a Troughton & Simms 10 inch theodolite and all the ordinary surveying instruments.

THE CHEMICAL LABORATORIES.

The chemical laboratories comprise a laboratory for qualitative analysis with accommodation for 40 students working at one time, a laboratory for quantitative analysis capable of accommodating 20 students and smaller rooms for special work such as water analysis, technical gas analysis, etc. The laboratories are fitted with the usual appliances.

BLOWPIPE AND ASSAYING LABORATORIES.

Six rooms are provided in this department, including a blowpipe laboratory with tables and other appliances for fifteen students ; an assaying laboratory with gas and charcoal furnaces ; a balance room, titration laboratory and store-rooms, with the equipment necessary for wet and dry assays.

PHYSICAL LABORATORY.

(University of Toronto).

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of mechanics, sound, light, heat and electricity. It is also well supplied with instruments of precision for individual work

in the same departments. In addition to an elementary laboratory, there are several special laboratories, which offer unusual facilities for the conduct of experiments in the various branches of physics.

The electrical apparatus includes electrometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre), Ruhmkorff coils, Crooke's tubes, telephones, etc. etc.

MODERN LANGUAGES.

No special examinations are held in these languages except in the Fourth Year, bnt it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, Etc.

The Library, Museums and Herbarium of the University of Toronto are open to regular students. The library fee is $2 per annum, payable in advance.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1891-92.

President.....R. W Thomson.
Vice-Presidents.....T. R. Deacon, A. T. Laing.
Secretary.....J. Keele.
Treasurer.....W. A. Bucke.
Corresponding Secretary.....W. A. Lea.
Librarian.....A. V. White.
Representatives—Graduates.....J. A. Duff, B.A., Grad. S.P.S.
Third Year.....J. B. Goodwin.
Second Year.....A. J. McPherson.
First Year.....A. T. Fraser.

The Society meets every second Tuesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

Membership fee, $1 per annum.

ALUMNI ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1892.

President.....J. Galbraith, M.A., Assoc. M. Inst. C.E.
First Vice-President....J. McAree, D.T.S.
Second Vice-President..J. L. Morris, C.E.
Councillors.....E. B. Hermon, D.L.S.
J. McDougall, B.A.
G. Mickle, B.A
G. H. Richardson.
T. K. Thomson, C.E.
Secretary-Treasurer....J. A. Duff, B.A.

Graduates are requested to keep the Secretary acquainted with their addresses.

SESSION 1891-2.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

DEPARTMENT OF CIVIL ENGINEERING.

1st Year.

Abrey, G. S.
Adams, J. C.
Boswell, E. J.
Burrell, H. S.
Bergey, A. E.
Black, C. A.
Burton, T.
Chalmers, J.
Drake, H. D.
Dobie, J. S.
Fitzsimons, H.
Fraser, A. T.
Fee, L.
Gibson, H. H.
Greene, F. T.
Gordon, J. P.
Hewett, C. H.
Herald, W. J.
Johnson, S. M.
Johnson, Geo.
Moore, H. H.
Matthews, M. E.
McTaggart, A. L.
Poussett, H. R.
Pruyn, D. B.
Robinson, F. J.
Sims, H. B.
Shields, J. D.
Self, Geo.
Topp, C. H.
Tye, A. T.
Wallbridge, C. M.
Watson, J.

2nd Year.

Ardagh, J. A. G.
Barker, H. F.
Brown, G. L.
Charlesworth, L. C.
Dunn, T. H.
Francis, W. J.
Fairbairn, J. M.
Hinde, E. W.
Jones, J. E.
Laidlaw, J. T.
McPherson, A. J.
McFarlen, T. J.
Mines, W.
Main, W. F.
McAllister, A. L.
Marani, V. G.
Macallum, A. F.
Russel, R.
Rolph, H.
Speller, F. N.
Squire, R. H.
Smith, A. D.
Taylor, W. V.
Watson, A.
Watson, R. B.

3rd Year.

Alison, T. H.
Anderson, A. G.
Fairchild, C.
Goodwin, J. B.
Laschinger, E. J.
Laing, A. T.
McEntee, B.
Mitchell, C. H.
Playfair, N. L.
Prentice, J. M.
Ross, J. A.
Smith, Albert.
Thomson, R. W.

DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

1st Year.

Angus, R. W.
Black, R. G.
Boyd, D. G.
Blachford, W. A.
Beauregard, A. T.
Brown, R. M.
Doyle, F. M.
Filion, S. B.
Jeffrey, J. R.
Johnston, A. C.
Lash, N. M.
Livingstone, H. K.
Minty, W.
Nicholson, C. J.
Ridout, C.
Stocking, F. T.
Spotton, A. K.
Tremaine, R. C. C.
Wood, H. T.
Wickson, F. R.
Wright, R. T.

2nd Year.

Bucke, W. A.
Goldie, A. R.
Hanly, J. B.
Hanly, S. C.
Lash, F. L.
Robertson, J. M.
Robertson, C. G.

3rd Year.

Lea, W. A.
Milne, C. G.
White, A. V.

DEPARTMENT OF ARCHITECTURE.

1st Year.

Ewart, J. A.
Langley, F. W.
Michie, H. S.
Williams, R. E.
Walker, J.

2nd Year.

Ballantyne, H. F.
Fingland, W.
Keele, J.

3rd Year.

Langley, C. E.

DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

1st Year.

Hagarty, H. J.

3rd Year.

Lawson, W.

4th Year.

James, O. S.

SPECIAL STUDENTS.

MECHANICAL ENGINEERING.

1st Year.

Gordon, B. Harvey, J. A. McCollum, H.

2nd Year.

Carroll, J. H.

ARCHITECTURE.

1st Year.

Clarke, J. T. Murray, D. B. Smith, S. F.
Heward, S. A. Ross, A. J.

DRAWING AND MATHEMATICS.

1st Year.

Phippen, J. B.

ANALYTICAL AND APPLIED CHEMISTRY.

1st Year.

Breithaupt, A. L. Emery, E. J.

METALLURGY AND ASSAYING.

Bucke, M. A., Grad. S.P.S. Gibson, T. W. Symmes, H. D., Grad. S.
English, A. B., Grad. S.P.S. McColl, A. B. P.S.

PRIZEMEN.

Engineering.

1879.—	I.	Year	J. McAree	1st prize.
1880.—	II.	Year	J. L. Morris	1st prize.
1881.—	I.	Year	G. H. Duggan	1st prize.
	II.	Year	D. Jeffrey	1st prize.
1882.—	I.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	II.	Year	G. H. Duggan	1st prize.
	III.	Year	D. Jeffrey	1st prize.
1883.—	I.	Year	B. A. Ludgate	1st prize.
	"	"	A. M. Bowman	2nd prize.
	II.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	III.	Year	G. H. Duggan	1st prize.
1884.—	II.	Year	B. A. Ludgate	1st prize.
	III.	Year	E. W. Stern	1st prize.
	"	"	A. R. Raymer	2nd prize.
1885.—	I.	Year	A. E. Lott	1st prize.
	"	"	J. Roger	2nd prize.
	II.	Year	T. K. Thomson	1st prize.
	III.	Year	B. A. Ludgate	1st prize.
1886.—	I.	Year	C. H. C, Wright	1st prize.
	"	"	J. E. Ross	2nd prize.
	II.	Year	A. E. Lott	1st prize.
1887.—	I.	Year	H. E. T. Haultain	1st prize.
	II.	Year	C. H. C. Wright	1st prize.
	III.	Year	A. E. Lott	1st prize.
	"	"	J. Roger	2nd prize.
1888.—	1.	Year	E. B. Merrill	1st prize.
	"	"	F. M. Bowman	2nd prize.
	II.	Year	D. D. James	1st prize.
	III.	Year	C. H. C. Wright	1st prize.

1889.— I. Year.....J. K. Robinson ....1st prize.
" " .....G. E. Silvester .....2nd prize.
II. Year..... .....E. B. Merrill.....1st prize.
" " .....F. M. Bowman ..... .2nd prize.
III. Year.....D. D. James.....1st prize.

1890.— I. Year.....C. Fairchild.....1st prize.
II. Year.....J. K. Robinson .....1st prize.
III. Year.....F. M. Bowman.....1st prize.
" " .....E. B. Merrill .....2nd prize.

1891.— I. Year.....A. J. McPherson.....1st prize.
" " .....R. B. Watson.....2nd prize.
II. Year.....J. B. Goodwin .....1st prize.
III. Year.....G. E. Silvester .....1st prize.
" " .....C. W. Dill.....2nd prize.

ARCHITECTURE.

I. Year.....H. Ballantyne.

UNIVERSITY OF TORONTO.

DEGREE OF C. E.

Date of Admission.

1885.....J. L. Morris.
1886.....J. H. Kennedy.
1889.....J. W. Tyrrell.
1892.....T. K. Thomson.
1892.....H. J. Chewett.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

CIVIL ENGINEERING.

1881.—Morris, J. L., C.E., P.L.S.,
Pembroke, Ont.

1882.—Jeffrey, D., Contractor,
Stratford, Ont.
Kennedy, J. H., C.E., P.L.S., Architect, etc.,
Shedden, Ont.
McAree, J., P.L.S., D.T.S.,
Toronto.

1883.—Burns, D., P.L.S.,
49 Washington Street, Allegheny, Pa.
Duggan, G. H.,
Chief Engineer, Dominion Bridge Co., Montreal.
Tyrrell, J. W., C.E., P. and D.L.S.,
Hamilton, Ont.

1884.—Kirkland, W. C.,
McDougall, J., B.A.,
Raymer, A. R.,
Engineer's Office, Lake Shore and Michigan Southern R. R.,
Toledo, O.
Robertson, J., P.L.S.,
Coad & Robertson, Civil Engineers, P. L. Surveyors, etc.,
Glencoe, Ont.
Stern, E. W.,
Engineer Architectural Iron Co., St. Louis, Mo.

1885.—Bleakley, F. W.,
Seattle, W. T.
Bowman, H. J., P. and D.L.S.,
Berlin, Ont.
Henderson, E. E., P.L.S.,
Canadian Pacific R. R., Brownville, Maine.
Ludgate, B. A., P.L.S.,
Peterboro', Ont.
McKay, O., P.L.S.,
Windsor, Ont.

1886.—Bowman, A. M., P. and D L.S.,
Toronto Technical School.
Hermon, E. B., P. and D.L.S.,
Vancouver, B. C.
Laird, R., P.L.S.,
City Surveyor's Office.
Thomson, T. K., C. E.
Supt. of Bridges for C. M. Jacobs, C.E., 192 Broadway, N.Y.
Tyrrell, H. G.,
Pencoyd Bridge and Construction Co., Penn.

1887.—Burns, J. C. (Deceased).
Lott, A. E.,
Atcheson, Topeka and Santa Fe R. R., Topeka, Kansas.
McCullough, A. L., P.L.S.,
Engineer's Office, West Toronto Junction.
Martin, F., P.L.S.,
Toronto. Ont.
Pinhey, C. H., P. and D.L.S.,
630 Wellington Street, Ottawa.
Roger. J., P.L.S.,
544 Lafayette Avenue, St. Paul, Minn.

1888.—Apsey, J. F., P.L.S.,
242 W. Biddle St., Baltimore, Md., U.S.
Ashbridge, W. T.,
City Engineer's Office, Toronto.
Ball, E. F.,
Medical Health Office, Toronto.
Brown, D. B., P.L.S.,
Mexican Southern Railway, Old Mexico.
Canniff, C. M.,
City Surveyor's Office, Toronto.
Chewett, H. J., A. M. Can. Soc. C. E., C. E.
Willis Chipman, C.E., 103 Bay Street, Toronto.
Gibbons, J., P.L.S.,
Renfrew, Ont.
McDowall, R., P.L.S.,
Owen Sound, Ont.
McFarlen, G. W., P.L.S.,
County Surveyor's Office, Toronto.
Marani, C. J.,
Lecturer in Sanitary Engineering, S.P.S., Toronto.
Mickle, G. R., B.A.,
Mining Engineer, Toronto.
Moore, J. H., P.L.S.,
Newmarket, Ont.
Richardson, G. H.,
Niagara Falls and River R. R.
Rose, K.,
Mexican Southern Railway, Old Mexico.
Ross, J. E., P.L.S.,
Riverside, Cal.
Wright, C. H. C.,
Lecturer in Architecture, S.P.S., Toronto.

1889.—Carey, B.,
Engineer's Office, Toronto. 30 Russell Street.
Chalmers, W. J.,
Railway Construction Work, Cedar Lake, Michigan.
Clement, W. A.,
City Engineer's Office, Toronto.
Hanning, G. F.,
City Engineer's Office, Toronto.
Haultain, H. E. T.,
Anglo-American Club, Freiberg, Germany.
Irvine, J.,
Harriston, Ont.
James, D. D.,
Toronto University.
Mill, F. X.,
Engineer's Office, Brockville.
Moberly, H. K.,
Frostburg, Va., U.S.A.
Rosebrugh, T. R., B.A.,
Lecturer in Electrical Engineering, S.P.S., Toronto.
Wickett, T.,
Toronto University.

1890.—Bowman, F. M.,
Pennsylvania Steel Co'y, Steelton, Pa.
Bucke, M. A.,
Geological Survey, Ottawa.
Corrigan, G. D.,
Union Pacific Railway, Seattle, W. T.
Duff, J. A., B.A.,
Fellow in Engineering, S. P. S., Toronto.
English, A. B.,
106 Gould Street, Toronto.
Garland, N. L.,
Eglinton, Ont.
Hutcheon, J., P.L.S.,
C. H. Keefer, C.E., Toronto.
Innes, W. L.,
C. P. R. Eng. Office, London, Ont.
Merrill, E. B.,
Toronto Technical School.
Pedder, J. R., P.L.S.,
J. Galt, C.E., Toronto.
Wiggins, T. H., P.L.S.,
Collingwood, Ont.
Withrow, W. J ,
Fetherstonhaugh & Co., Toronto.

1891.—Beatty, H. J.,
Pembroke, Ont.
Deacon, T. R.,
Surveyor's Office, North Bay, Ont.
Dill. C. W.,
Engineer's Office, Brockville, Ont.
Lane, A.,
Engineer's Office, West Toronto Junction.
McAllister, J. E.,
Canadian Bridge Co., Montreal, P. Q.
Moore, J. E. A.,
C. P. R., Islington, Ont.
Newman, W.,
Surveyor's Office, Leamington, Ont.
Robinson, J. K, Deceased..
Russel, W.,
Railway Construction, Newfoundland.
Silvester. G. E.,
Surveyor's Office, Sudbury, Ont.
Symmes, H. D.,
Chignecto Ship Railway, N.S.

Mechanical and Electrical Engineering.

1890.—Ross, R. A.,
Edison Electric Co., Peterboro', Ont.

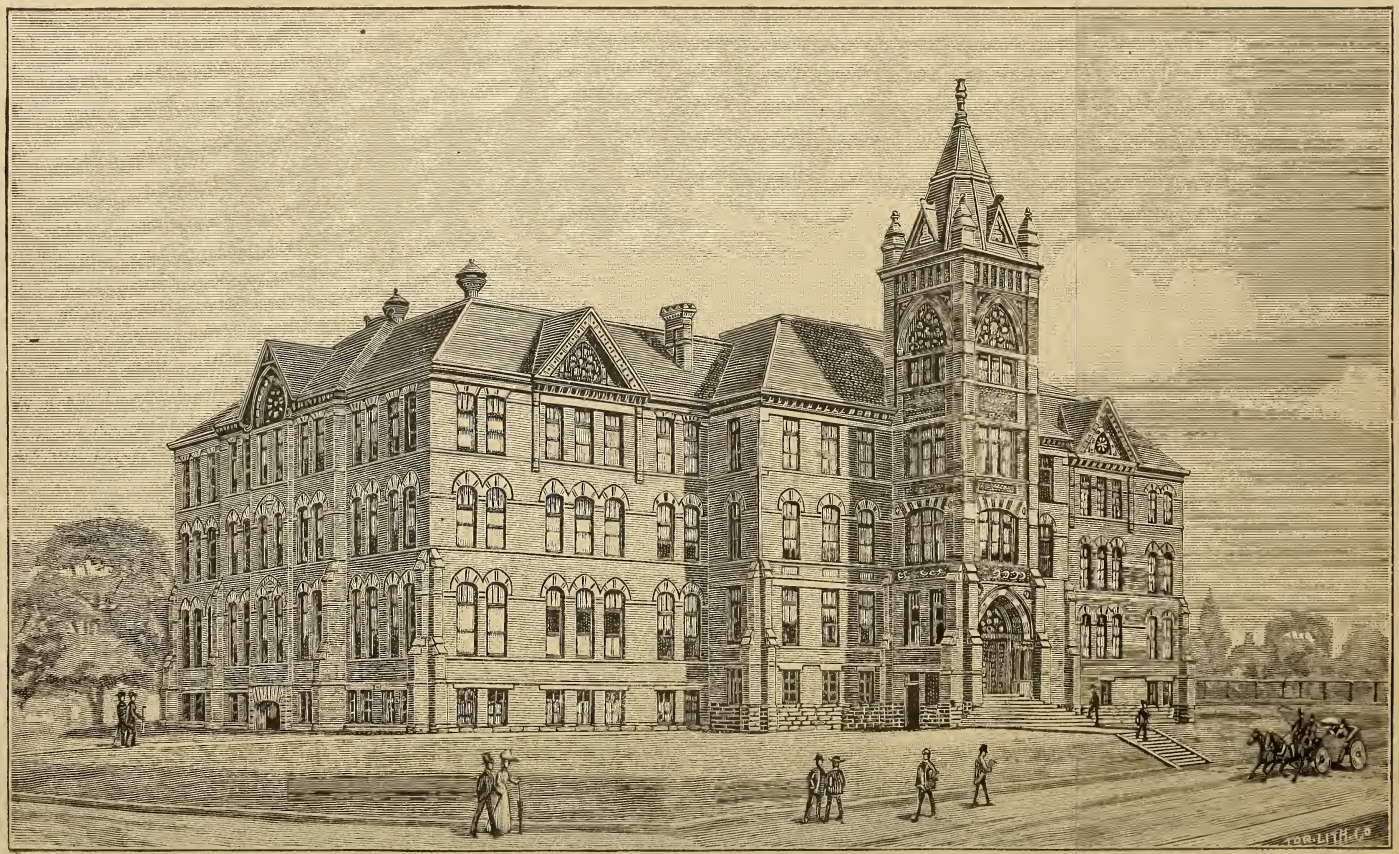
1891.—Merrill, E. B.
Toronto Technical School.

ANALYTICAL AND APPLIED CHEMISTRY.

1890.—Boustead, W. E., B.A.Sc.
Toronto.

1891.—James, O. S..
S. P. S., Toronto, Ont.

[Frontispiece.



SCHOOL OF PRACTICAL SCIENCE, TORONTO.

CALENDAR

OF THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and the Regulations for Diplomas.

16th Session, 1893-94.

TORONTO:
PRINTED BY WARWICK & SONS, 68 AND 70 FRONT STREET WEST.
1893.

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1893.

SEPTEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

22. Meeting of Council.
27. **Entrance Examinations** begin.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..

2. **FIRST TERM** begins. Supplemental Examinations begin.
13. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FEB	SAT.
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..

10. Meeting of Council.

1894.

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	..	..	..	..	..	..

8. Meeting of Council.
22. **FIRST TERM** ends.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	..	..	..
..	..	..	..	..	..	..

8. **SECOND TERM** begins.
12. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU	FRI.	SAT.
..	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	..	..	..
..	..	..	..	..	..	..

9. Meeting of Council.
7. Ash Wednesday. Building closed.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

9. Meeting of Council.
23. Good Friday. Building closed.

APRIL.

SUN.	MON.	TUE.	WED	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	..	..	..	..	..

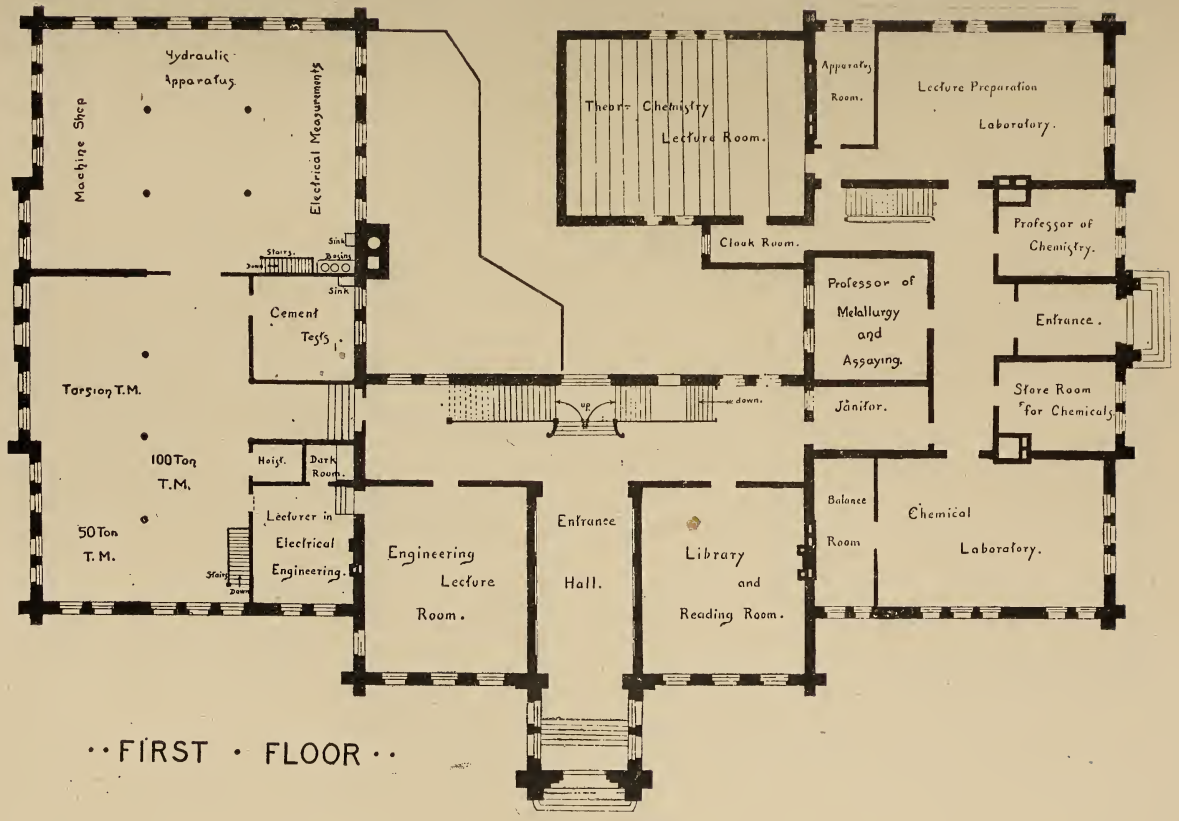
9. Lectures and Practical Work close.
13. Meeting of Council.
16. **Examinations begin.**

MAY.

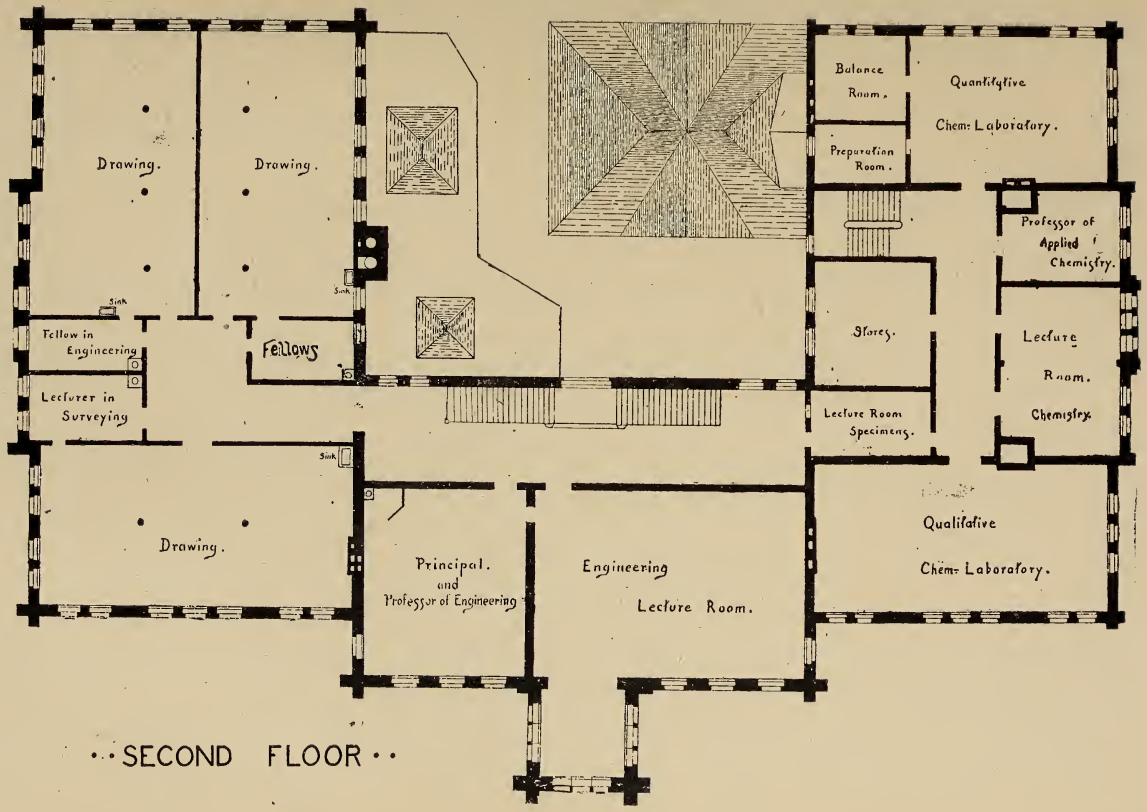
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	..	..

. **SECOND TERM** ends.

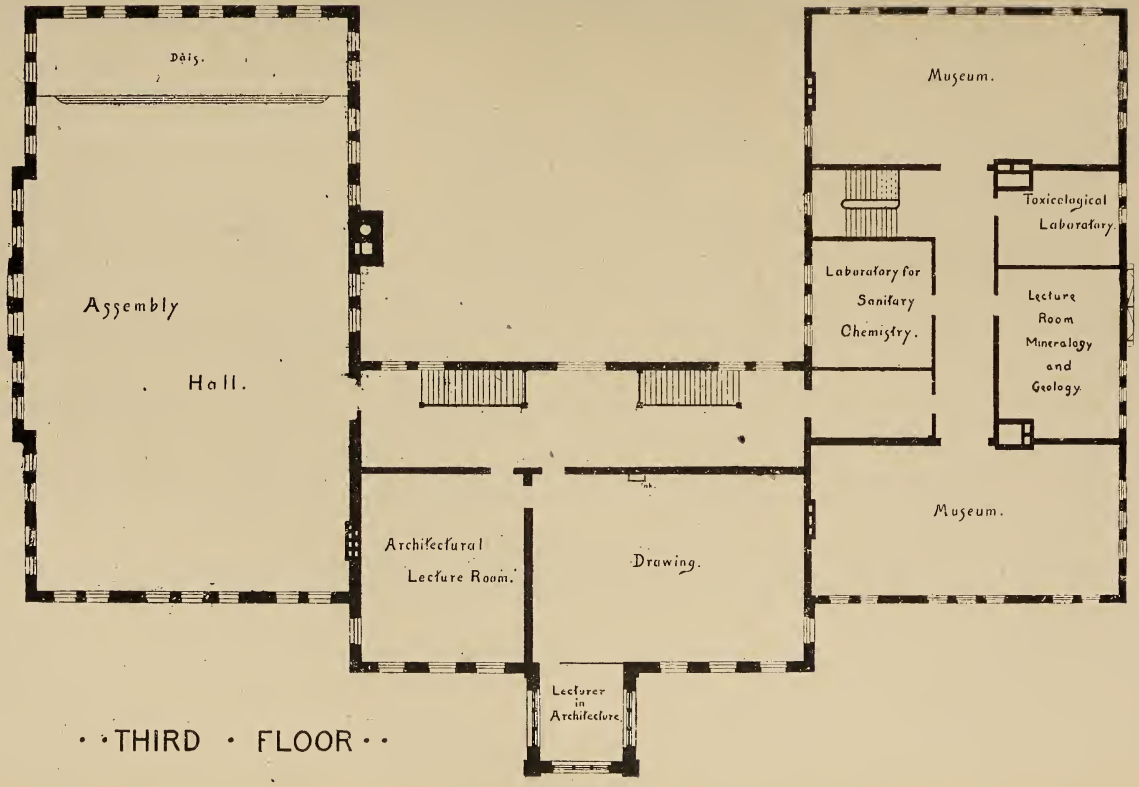
GROUND · FLOOR


Hydraulic Apparatus
Machine Shop
Electrical Measurements
Stairs
Sink
Basins
Sink
Cement Tests
Torsion T.M.
100 Ton T.M.
50 Ton T.M.
Hoist.
Dark Room.
Lecturer in Electrical Engineering.
Stairs Down
Engineering Lecture Room.
Entrance Hall.
Library and Reading Room.
up
down
Theoretical Chemistry Lecture Room.
Apparatus Room.
Lecture Preparation Laboratory.
Cloak Room.
Professor of Chemistry.
Professor of Metallurgy and Assaying.
Entrance.
Janitor.
Store Room for Chemicals
Balance Room
Chemical Laboratory.

FIRST FLOOR



··SECOND FLOOR··


Dais.
Assembly
Hall.
Museum.
Toxicological
Laboratory.
Laboratory for
Sanitary
Chemistry.
Lecture
Room
Mineralogy
and
Geology.
Museum.
Architectural
Lecture Room.
Drawing.
Lecturer
in
Architecture.

THIRD FLOOR

TIME-TABLE—FIRST YEAR—SESSION 1893-4.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	*Trigonometry.	*Euclid.	*Analytical Geometry.	*Algebra.	*Trigonometry.	9-10
10-11	*Elect'y & Magn'm, 2, 5, (*a*). History of Arch'e, 4. rawing, 1, 3. do. 2, 5, (*b*).	Statics.	*Acoustics, 4, (*a*). Drawing, 1, 2, 3, 5. do. 4, (*b*).	Statics.	*Elect'y & Magn'm, 2, 5, (*a*). Pen and Ink, 4. Drawing, 1, 3. do. 2, 5, (*b*)	10-11
11-12	Drawing.	Chemistry.	History of Arch'e, 4, (*a*). Drawing.	Chemistry.	Drawing.	11-12
12-1	Drawing.	Dynamics.	Descriptive Geometry.	Drawing.	Surveying, 1, 2, 3, 4. Drawing, 5.	12-1
1-2						1-2
2-3	Chemical Lab'y, 2, 3, 5. Drawing, 1, 4.	*Physical Lab'y, 2, 5, (*a*). Field Work, 1, 3, 4, (*a*). Drawing, (*b*).	Chemistry.	*Physical Lab'y, 2, 5, (*a*). Field Work, 1, 3, 4, (*a*). Drawing, (*b*).	*Physical Lab'y, 2, 5, (*a*). Chemical Lab'y, 5, (*b*). Field Work, 1, 3, 4, (*a*). Drawing, 1, 2, 3. 4, (*b*)	2-3
3-4	Chemical Lab'y, 2, 3, 5. Drawing, 1, 4.	*Physical Lab'y. 2, 5, (*a*). Field Work, 1, 3, 4, (*a*). Drawing, (*b*).	Chemical Lab'y, 1, 4, 5. Drawing, 2, 3.	*Physical Lab'y, 2, 5, (*a*). Field Work, 1, 3, 4, (*a*), Drawing, (*b*).	*Physical Lab'y, 2, 5, (*a*) Chemical Lab'y, 5, (*b*). Field Work, 1, 3, 4, (*a*). Drawing, 1, 2, 3, 4. (*b*).	3-4
4-5	Chemical Lab'y, 2, 3, 5. Drawing, 1, 4.	*Physical Lab'y, 2, 5, (*a*). Field Work, 1, 3, 4, (*a*). Drawing, (*b*).	Chemical Lab'y, 1, 4, 5. Drawing. 2, 3.	*Physical Lab'y, 2, 5, (*a*). Field Work, 1, 3, 4, (*a*). Drawing, (*b*).	*Physical Lab'y, 2, 5, (*a*). Chemical Lab'y, 5, (*b*). Field Work, 1. 3, 4, (*a*). Drawing, 1, 2, 3, 4, (*b*).	4-5

1, Civil Engineering; 2, Mechanical and Electrical Engineering; 3, Mining Engineering; 4, Architecture; 5, Analytical and Applied Chemistry.
*University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments.

TIME-TABLE.—SECOND YEAR—SESSION 1893-4.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	*Calculus. (*b*) Chemical Lab'y, 5, (*a*). Drawing, 1, 2, 3, 4, (*a*).	*Astronomy, 1, 3, (*a*) Electricity, 2, 5. History of Arch'e, 4. Metallurgy, 3, (*b*). Drawing, 1, (*b*).	Rigid Dynamics, 1,2,3. History of Ornament,4. Chemical Lab y, 5.	*Astronomy, 1, 3, (*a*). Electricity, 2, 5. Orders of Arch'e, 4. Metallurgy, 3, (*b*). Drawing, 1, (*b*).	*Calculus.	9 10
10 11	*Optics, (*b*). Chemical Lab'y, 5, (*a*). Drawing, 1, 2, 3, 4, (*a*).	*Hydrostatics, (*b*). Mining & Ore dres'g, 3,(*a*). Chemical Lab'y, 5,(*a*). Drawing. 1, 2, 4,(*a*).	Descript'e Geo. 1,2,3,4. Chemical Lab'y, 5.	*Hydrostatics, (*b*). Mining & Ore Dress. 3, (*a*). Chemical Lab'y, 5,(*a*). Drawing, 1, 2, 4,(*a*).	*Optics (*b*). Surveying (lect.)1,3,4, (*a*). Chemical Lab'y, 5, (*a*). Drawing, 2, (*a*).	10-11
11-12	Mineralogy & Geology, 1, 3, 4 5. Theory of Mech'ism, 2.	Chemical Laboratory.	Mineralogy and Geology, 1, 3, 4 5. Theory of Mech'ism, 2.	Chemical Lab'y, 5. Drawing, 1, 2, 3, 4.	Pen and Ink, 4. Chemical Lab'y, 5. Drawing, 1, 2, 3.	11-12
12 1	Strength of Materials, 1, 2, 3, 4. Chemical Lab'y, 5.	Chemical Laboratory.	Strength of Materials, 1, 2, 3, 4. Chemical Lab'y, 5.	Chemical Lab'y, 5. Drawing, 1, 2, 3, 4.	Chemical Lab'y, 5. Drawing, 1, 2, 3, 4.	12-1
1-2						1-2
2-3	Mineralog'l Lab'y, 1, 3. Electrical do 2, 5. Drawing, 4.	Applied Chemistry.	Spherical Trig'y. 1,2,3,5,	Applied Chemistry.	*Physical Lab'y, 2, 5 (*a*). do. 1, 3, 4, (*b*). Drawing, 2, (*b*)	2 3
3-4	Mineralog'l Lab'y, 1,3. Electrical do 2, 5. Drawing, 4.	*Physical Lab'y, 1,3,4, (*b*). Mineralogical Lab'y, 5. Field Work, 1, 3, 4, (*a*). Drawing, 2.	*Physical Lab'y, 2, 5, (*a*). Chemical Lab'y, 5, (*b*). Drawing, 1, 3, 4. do. 2, (*b*).	*Physical Lab'y, 1, 3, 4,(*b*). Mineralogical Lab'y, 5. Field Work, 1, 3, 4,(*a*). Drawing, 2.	*Physical Lab'y, 2, 5,(*a*). do. 1, 3, 4, (*b*). Field Work, 1, 3, 4, (*a*). Chemical Lab'y, 5, (*b*). Drawing, 2, (*b*),	3-4
4-5	Mineralog'l Lab'y, 1, 3. Electrical do 2, 5. Drawing, 4.	*Physical Lab'y, 1, 3, 4, (*b*). Mineralogical Lab'y, 5. Field Work, 1, 3, 4, (*a*). Drawing, 2.	*Physical Lab'y, 2, 5, (*a*). Chemical Lab'y, 5, (*b*). Drawing, 1, 3, 4, do. 2, (*b*).	*Physical Lab'y, 1, 3, 4, (*b*). Mineralogical Lab'y, 5. Field Work, 1, 3, 4, (*a*) Drawing, 2.	*Physical Lab'y, 2, 5. (*a*). do. 1, 3, 4, (*b*). Field Work, 1, 3, 4, (*a*). Chemical Lab'y, 5, (*b*). Drawing, 2, (*b*).	4-5

1, Civil Engineering; 2, Mechanical and Electrical Engineering; 3, Mining Engineering; 4, Architecture; 5, Analytical and Applied Chemistry.
*University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments.

TIME-TABLE.—THIRD YEAR—SESSION 1893-4.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	Thermodynamics, 1, 2, 3, 5. Drawing 4.	Hydraulics, 1, 2, 3, 4,	Thermodynamics, 1,2,3,5. Drawing, 4.	Hydraulics, 1, 2, 3, 4.	Theory of Compound Stress, 1, 2, 3, 4.	9-10
10-11	Drawing, 1, 2, 3, 4.	Astronomy and Geodesy, 1, 3. Machine Design, 2. Drawing, 4.	Pen and Ink, 4. Mineralog'l Lab., 1,3,5,(*a*). Assaying, 3, (*b*) Drawing, 2. do. 1, (*b*).	Astronomy and Geodesy 4, 3. Machine Design, 2 Plumbing, Heating & Ventilation. 4.	Drawing, 1, 2, 3, 4.	10-11
11-12	Drawing, 1, 2, 3, 4.	Surveying(lecture)1,3. do. 4,(*a*). Principles of Dec'n., 4, (*b*). Drawing, 2.	Mineralog'l Lab., 1,3,5,(*a*). Assaying, 3, (*b*). Drawing, 2, 4. do. 1, (*b*).	Descriptive Geom. 1,2,3,4,(*a*). Theo. of Least Squares (*b*).	Drawing, 1, 2, 3, 4.	11-12
12-1	Applied Chemistry.	Mineralogy and Geology 1,3,4,5. Mechanics of Machinery, 2.	Mineralog'l Lab., 1,3,5,(*a*). Assaying, 3, (*b*). Drawing, 2, 4. do. 1, (*b*).	Mineralogy & Geology 1, 3, 4, 5. Electricity, 2.	Applied Chemistry. Mining & Ore-dres'g, 3, (*b*)	12-1
1-2						1-2
2-3	*Physical Lab'y, 2, 5, (*a*). Constructive Design, 1, 3, 4. Drawing, 2, (*b*).	Field Work, 1, 3, (*a*). Electrical Lab'y, 2. Assaying, 3, (*b*). History of Arch'e, 4. Drawing, 1, (*b*).	Constructive Design, 1, 3, 4. Drawing, 2.	Field work, 1, 3, (*a*) Electrical Lab'y, 2. Assaying, 3, (*b*), History of Arch'e, 4. Drawing 1, (*b*).	*Physical Lab'y, 2, 5, (*a*). do. 1, 3, 4, (*b*). Field Work, 1, 3, 4, (*a*). Drawing, 2, (*b*).	2-3
3-4	*Physical Lab'y, 2, 5, (*a*). Drawing, 1, 3, 4. do. 2, (*b*).	Field Work, 1, 3, 4, (*a*). Electrical Lab'y, 2. Assaying, 3, (*b*). Drawing, 1, 4, (*b*).	Drawing, 1, 2, 3, 4.	Field Work, 1, 3, 4, (*a*). Electrical Lab'y. 2, Assaying, 3, (*b*). Drawing, 1, 4, (*b*).	*Physical Lab'y, 2, 5, (*a*). do. 1, 3, 4, (*b*). Field Work, 1, 3, 4, (*a*). Drawing, 2, (*b*).	3-4
4-5	*Physical Lab'y, 2, 5, (*a*), Drawing, 1, 3, 4. do. 2, (*b*).	Field Work, 1, 3, 4, (*a*). Electrical Lab'y, 2, (*a*), Metallurgy, 1, 2, 3, (*b*). Drawing, 4, (*b*).	Drawing, 1, 2, 3, 4.	Field Work, 1, 3, 4, (*a*). Electrical Lab'y, 2, (*a*). Metallurgy, 1, 2, 3, (*b*). Drawing, 4, (*b*).	*Physical Lab'y, 2, 5, (*a*). do. 1, 3, 4, (*b*). Field Work, 1, 3, 4, (*a*). Drawing, 2, (*b*).	4-5

1, Civil Engineering ; 2, Mechanical and Electrical Engineering ; 3, Mining Engineering ; 4, Architecture ; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—FOURTH OR POST-GRADUATE YEAR.

There is no regular time-table for the work of this year. The time of the students is spent almost wholly in the engineering, chemical, and assaying laboratories. The hours are from 9 a.m. to 5 p.m. every working day during the session. Lectures are given at such intervals as may suit the laboratory work.

FACULTY OF THE SCHOOL.

J. GALBRAITH, M.A , M. Can. Soc. C.E., Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., *Professor of Engineering* (*Chairman*).
W. H. ELLIS, M.A., M.B.....*Professor of Applied Chemistry.*
A. P. COLEMAN, M.A., Ph. D.....*Professor of Assaying and Metallurgy.*
L. B. STEWART, P.L.S., D.T.S.....*Lecturer in Surveying* (*Secretary*).
C. H. C. WRIGHT, B.A.Sc.....*Lecturer in Architecture.*
T. R. ROSEBRUGH, M.A., Grad. S.P.S...*Lecturer in Electrical Engineering.*

ASSISTANT INSTRUCTORS.

J. A. DUFF, B A., Grad. S.P.S..... ....*Fellow in Civil Engineering.*
E. B. MERRILL, B.A., Grad. S.P.S .....*Fellow in Mechanical Engineering.*
A. LANE, Grad. S.P.S.....*Fellow in Surveying.*
W. E. BOUSTEAD, Grad. S.P.S., B.A.Sc. *Fellow in Metallurgy and Assaying.*
R. W. ROSS, M.A.....*Fellow in Analytical and Applied Chemistry.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

JAMES LOUDON, M.A .....*President and Professor of Physics.*
E. J. CHAPMAN, Ph. D., LL.D. .....*Professor of Mineralogy and Geology.*
R. RAMSAY WRIGHT, M.A., B. Sc.....*Professor of Biology.*
W. H. PIKE, M.A., Ph. D.....*Professor of Chemistry.*
ALFRED BAKER, M.A .....*Professor of Mathematics.*
A. B. MACALLUM, B.A., M.B., Ph. D....*Professor of Physiology.*
W. J. LOUDON, B.A .....*Demonstrator in Physics.*
C. A. CHANT, B.A ....*Lecturer in Physics.*
J. C. McLENNAN, B.A.....*Assistant Demonstrator in Physics.*
ALFRED T. DeLURY, B.A.....*Lecturer in Mathematics.*
W. L. MILLER, B.A., Ph. D.....*Demonstrator in Chemistry.*
J. W. ODELL, B.A.....*Fellow in Mathematics.*
G. F. HULL, B.A..... .....*Fellow in Physics.*

For information further than that contained in the Calendar, application may be made to the Secretary, L. B. STEWART.

School of Practical Science,

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1893-94.

In the session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted :—

1. Civil Engineering (including Sanitary Engineering).
2. Mechanical and Electrical Engineering.
3. Mining Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also to give him such a training as will make him immediately useful when he enters into active professional work.

In order to afford an opportunity of taking full advantage of the engineering, chemical and assaying laboratories a fourth or post-graduate year has been established. In the regular three years' course the laboratory and practical work is of such a nature that it can be successfully carried on in the intervals between lectures. All laboratory work which cannot be advantageously pursued in connection with a fixed time table for lectures has been reserved for the fourth year. The fourth year is thus essentially a laboratory year. Lectures are given in connection with the work as occasion requires. Graduates who fulfil the requirements of the fourth year are eligible for the degree of Bachelor of Applied Science (B.A.Sc.) University of Toronto. Graduates in the Department of Civil Engineering are also eligible for the degree of Civil Engineer (C. E.), University of Toronto, after three years of practical work.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour, the Lieutenant-Governor in Council, the 16th day of June, 1893.

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be Chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma shall be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments :—

(1) Civil Engineering (including Sanitary Engineering).

(2) Mechanical and Electrical Engineering.

(3) Mining Engineering.

(4) Architecture.

(5) Analytical and Applied Chemistry.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. Students may enter the Regular Course in any one of the above Departments either *(a)* by presenting certificates of having passed the Matriculation Examination in any University in Her Majesty's Dominions or the High School Leaving Examination of the Pro-

vince of Ontario, or *(b)* by presenting certificates of having had at least one year's experience in some recognized engineering, architectural or manufacturing work or business, and passing an examination in the following subjects :—

Arithmetic.—Fundamental rules, metric system, fractions, decimals, powers, square root, mensuration, percentage, interest.

Algebra.—Elementary rules, easy factoring, highest common measure, lowest common multiple, square root, fractions, ratio, simple equations of one, two or three unknown quantities, indices, surds, quadratic equations of one and two unknown quantities.

Euclid.—Books I, II, and III ; deductions.

English.—Dictation, composition.

6. The Council shall have the power of dealing with special cases provided the candidates are sufficiently prepared to take their places in the classes.

7. Special students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper.

8. Certificates of attendance and standing, may be given upon due examination to special students, and such students shall not be required to pass an entrance examination.

9. At the end of the Academic Year, examinations will be held in the different subjects taught. Candidates for Diplomas and Certificates are required to enter for these.

10. All regular students shall be in attendance at the school during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

11. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

ADMISSION.

The conditions of admission for regular and special students are stated in clauses 5, 6, 7 and 8 of the order-in-council, pp. 19 and 20.

For information regarding the conditions for matriculation in the Universities, application must be made to the registrars of these institutions.

Information respecting the High School Leaving Examination may be obtained from the Education Department, Toronto, or from any Principal of a High School or Collegiate Institute.

Students intending to write at the High School Leaving Examination for the purpose of entering the School of Practical Science, may do so without having previously passed the Primary Examination. Their papers must be endorsed "For admission to School of Practical Science."

The only examination held in the School of Practical Science for the purpose of testing qualifications for admission, is that mentioned in clause 5 (*b*) order-in-council, p. 20.

This examination will begin at 9 a.m. Wednesday, September 27th, 1893.

FORM OF DIPLOMA.

THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO.

(Established 1878.)

THIS IS TO CERTIFY *that*

.....

of the.....*in the*.....

.....*has completed the Regular Course*

of this School for the Diploma in the.....

extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz.:

.....

.....

.....

Wherefore *the said*.....

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

In Witness *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

.....*One thousand eight hundred and*.....

and have caused the seal of this School to be hereunto affixed.

.....*Chairman.*

L.S.]

.....*Secretary.*

Regular Courses for the Diploma.

See regulations, pp. 19 and 20.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Sanitary Engineering).
(2) Mechanical and Electrical Engineering.
(3) Mining Engineering.
(4) Architecture.
(5) Analytical and Applied Chemistry.

SESSIONAL AND OTHER FEES, DEPOSITS, ETC.

The sessional fees for instruction in any of the regular courses, are as follows :—

First Year.....Thirty-four Dollars.
Second Year.....Forty-four Dollars.
Third Year .....Fifty-four Dollars.

These are payable in two equal instalments, one in each term. A discount of two dollars will be made on each instalment if paid before the end of the first calendar month of the term in which it is due. There is no extra fee for the Diploma.

Deposits.

General $2 00
Chemical laboratory..... 3 00
Mineralogical laboratory..... 7 00

Dues.

Library $1 00
For maintenance of Physical Laboratory.

Departments.	I. Year.	II. Year.	III. Year.
	$ c.	$ c.	$ c.
Civil and Mining Engineering	.....	1 50	1 00
Mechanical and Electrical Engineering ..	1 00	1 50	3 00
Architecture.....	.....	1 00	2 00
Analytical and Applied Chemistry	1 00	1 50	3 00

The discount on the instalment of sessional fees payable in the first term will not be allowed unless all deposits and other dues are paid at the same time.

ESTIMATED EXPENSES OF A REGULAR COURSE.

Sessional Fees	$120 00
Books, instruments, drawing materials, laboratory fees, etc., about as follows—	
I. Year, $60 ; Second Year, $40 ; III. Year, $30	130 00
Total for Regular Course about.....	$250 00

Information as to instruments and materials will be given to the students on registration at the beginning of the Session.

FELLOWSHIPS.

The following fellowships have been established, open to graduates of the school :—Civil Engineering, Mechanical Engineering, Surveying, Metallurgy and Assaying, Analytical and Applied Chemistry.

Each fellowship is of the value of $500 per annum.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respective Years and Departments : —

Subject.	Civil and Mining Engineering.			Mechanical and Electrical Engineering.			Architecture.		
	I. Year.	II. Year.	III. Year.	I. Year.	II. Year.	III. Year.	I. Year.	II. Year.	III. Year.
Applied Mechanics..	*8	6	8	10	15	12	8	5	6
Descript. Geometry.	*7	12	11	11	7	10	7	9	10
Surveying.....	6	4	4	0	0	0	2	0	0
Architecture.....	0	0	0	0	0	0	7	9	7

* These drawings will also be required in the Department of Analytical and Applied Chemistry.

The above minimum number of drawings will include only such drawings as shall be specially prescribed for the purpose.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned minimum number of drawings must be made, together with as many others as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The minimum number of drawings shall be 25 and the maximum number 35, except in the Department of Analytical and Applied Chemistry, in which the numbers shall be 18 and 25 respectively.

The drawings must be made on paper 15x22 inches, unless otherwise prescribed.

At the end of each term the drawings must be neatly bound together between covers of approved pattern before they are finally examined, and the student's name, together with his year, term and date, neatly printed on said cover.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the school without permission

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

No field notes will be counted which have not been taken in the field, and during the hours allotted to such work.

The penalties for the infringement of the above two rules will be determined in each case by the Council.

Vacation Work.

Vacation work must be handed in during the first week of the ensuing session, otherwise it will not be counted.

Vacation notes must be on construction only, and consist of not less than 20, nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap, and consist of not less than 20, nor more than 30 pages.

The minimum percentage of marks required for practical work must be made in the case of vacation notes and theses.

No notes, whether taken during the session or the vacation, will be counted unless made in the standard note books of the School.

Theses must be accompanied by carefully made drawings and illustrations separated from the text, and be bound between flat covers.

The sketches for the second year thesis in the Architectural Course are to be made on one side of the sheet of a sketch book and mounted on cardboard or paper 15″ x 22″.

The Architectural students are advised to spend the vacation in an architect's office.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject, he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations in subjects taught by the staff of the school will begin on the first day of the session. In other subjects they will be held at the time of the annual examinations.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between 9 a.m. and 5 p.m. at the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted, unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

PRIZES.

Through the liberality of Mr. D. B. Dick, Architect, Toronto, a prize of $10 in books will be open annually for competition in the first year of the Architectural Department.

HONORS.

Honors will be granted in each department to students who pass in all the subjects and obtain at least 66 per cent of the total number of marks allotted to the department at the annual examinations.

The Honor list will be arranged alphabetically.

REGULAR EXAMINATIONS.

(Approximate List.)

I. YEAR.

Examinations held at end of session.

Algebra.
Euclid.
Plane Trigonometry.
Analytical Geometry.
History of Architecture..... 4.
Magnetism and Electricity...2, 5.
Statics.
Dynamics.
Descriptive Geometry.
Surveying.....1, 2, 3, 4.
Chemistry, Elementary.
Electricity.....2, 5.

Examinations held during the session.

Drawings.
Field Notes.....1, 3, 4.
Construction Notes.....1, 2, 3, 4.
Experimental Physics.....2, 5.
Practical Chemistry.
French and German.....5.

II. YEAR.

Examinations held at end of session.

Calculus.
Astronomy.....1, 3.
Optics.
Strength of Materials.....1, 2, 3, 4.
Rigid Dynamics.....1, 2, 3.
Theory of Mechanism..... 2.

1 Civil Engineering. 2 Mechanical and Electrical Engineering.
3 Mining Engineering. 4 Architecture.
5 Analytical and Applied Chemistry.

Hydrostatics
History of Architecture.....4.
Orders of Architecture.....4.
History of Ornament.....4.
Chemistry, Inorganic.....5.
Chemistry, Applied.
Descriptive Geometry....1, 2, 3, 4.
Surveying .....1, 3, 4.
Spherical Trigonometry.....1, 2, 3.
Mineralogy and Geology...1, 3, 4, 5.
Electricity.....2, 5.
Metallurgy.....3.
Mining.....3.

Examinations held during the session.

Drawings.....1, 2, 3, 4.
Field Notes.....1, 3.
Construction Notes.....1, 2, 3, 4.
Experimental Physics.
Thesis (at beginning of session).
Chemistry, Practical.
Mineralogy, Practical.....1, 3, 5.

III. YEAR.

Examinations held at end of session.

Magnetism and Electricity....2, 5.
History of Architecture.....4.
History of Ornament.....4.
Principles of Decoration.....4.
Method of Least Squares.
Chemistry, Inorganic & Organic, 5.
Chemistry Applied.
Mineralogy and Geology...1,3,4,5.
Sanitary Plumbing, Heating and Ventilation.....4.
Theory of Compound Stress, 1,2,3,4.
Theory of Construction.....1, 3, 4.
Mechanics of Machinery.....2.
Machine Design.....2.
Hydraulics.....1, 2, 3, 4.
Thermodynamics.....1, 2, 3, 5.
Descriptive Geometry .....1, 2, 3, 4.
Practical Astronomy and Geodesy, 1,3.
Surveying and Levelling....1, 3, 4.
Metallurgy.
Mining and Ore Dressing.....3.

Examinations held during the session.

Drawings.....1, 2, 3, 4.
Field Notes.....1, 3.
Construction Notes.....1, 2, 3, 4.
Experimental Physics.
Thesis (at beginning of session).
Chemistry, Practical.
Mineralogy, Determinative...1, 3, 5.
Assaying.....3, 5.

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1 Civil Engineering. 2 Mechanical and Electrical Engineering.
3 Mining Engineering. 4 Architecture.
5 Analytical and Applied Chemistry.

I. DEPARTMENT OF CIVIL ENGINEERING.

(*Including Sanitary Engineering.*)

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Sanitary Engineers).

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

DRAWING.

Copying from the flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astronomy.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Hydrographic Surveying.

CHEMISTRY.

Chemistry with special reference to industrial applications.
Practical chemistry.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe practice.
Determination of minerals.

III. YEAR.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.
Method of Least Squares.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
Bridges, Roofs, Floors.
Arches, Retaining Walls.
Foundations, etc.
Thermodynamics and Theory of the Steam Engine.
Hydraulics, Sewerage, Water Supply.
Sanitary Plumbing, Heating and Ventilation.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross sections, Field work and Plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a sphere .
Practical Astronomy (treated in the manner required for the P.L.S. and D.L.S. Examinations).

CHEMISTRY (APPLIED).

Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

METALLURGY.

Iron and Steel.

Mineralogy and Geology.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

II. DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

I. YEAR.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

Mechanics.

Statics and Dynamics (with special reference to structures and machines).

Physics.

Magnetism and Electricity.

Experimental Physics.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

Drawing.

Copying from the flat, Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

Surveying.

(Lectures only). Applications of Trigonometry and Principles of Measurement.

Chemistry.

Elementary Chemistry with Laboratory Practice.

II. YEAR.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Physics.

Hydrostatics.
Optics.
Electrical Measurements.

Experimental Physics.

Heat: Specific Heat. Latent Heat.
Expansion of Air. Air Thermometer.
Electricity and Magnetism.
- Calculation of Elements of Terrestrial Magnetism.
- Declination, Dip, and Horizonal Intensity.
- Tangent Galvanometer.
- Use of Voltameter.
- Use of Deprez and Thomson Galvanometers.

Drawing.

Subjects of first year continued.
Coloring and shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and structures. (Drawings made from both copies and original notes.)

Engineering.

Statics and Dynamics (pure and applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials and Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

Chemistry.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

III. YEAR.

Experimental Physics.

Electric Light Photometry.
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.
Method of Least Squares.

Drawing.

Subjects of previous years continued.
Descriptive Geometry :
- Shades and Shadows.
- Stone cutting.
- Perspective Projection.

Original Designs.

Engine and Machine Design.

Engineering.

Subjects of previous years continued.
Applied Mechanics :
- Mechanics of Machinery.
- Machine Design.
- Thermodynamics and Theory of the Steam Engine.
- Hydraulics.

Electricity :
- Dynamos and motors.

Application of principles to practical problems connected with the design, construction and testing of various prime motors and machines.
Experimental work in Engineering Laboratory.

Chemistry (Applied).

Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

Metallurgy.

Iron, Steel, Nickel, Copper, etc.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical and Electrical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

III. DEPARTMENT OF MINING ENGINEERING.

This Department is designed to afford the necessary preliminary training to students intending to become Mining Engineers.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

DRAWING.

Copying from the flat. Lettering. Topography.
Original Surveys.
Graphics.
Descriptive Geometry in its application to plane sided solids. Orthographic (including Isometric) and Oblique Projection.

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

II. YEAR.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astromony.

Physics.

Hydrostatics.
Optics.

Experimental Physics.

Light: Use of lenses and mirrors.
Calculat on of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

Drawing.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

Engineering and Surveying.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Mining Surveying.

Chemistry.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

METALLURGY.

Iron and Steel.
Mining and Ore Dressing.

III. YEAR.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat. Latent Heat.
Expansion of Air, Air Thermometer.
Method of Least Squares.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
Bridges, Roofs, Floors.
Arches, Retaining Walls.
Foundation, etc.
Thermodynamics and Theory of Steam Engine.
Hydraulics.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross-sections, field work and plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a Sphere).
Practical Astronomy (treated in the manner required for the P.L.S. and D.L.S. Examinations).

CHEMISTRY (APPLIED).

Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

MINERALOGY AND GEOLOGY.

Economic Geology.
Palæontology.
Blowpipe Analysis and Determinative Mineralogy.
Metallurgy of Gold, Silver, Nickel, Copper, etc.
Mining and Ore Dressing continued.
Assaying.

IV. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Plane Analytical Geometry.

MECHANICS.

Statics (with reference to structures).
Dynamics (preliminary to the study of hydraulics).

PHYSICS.

Acoustics.

DRAWING.

Instrumental and Free-hand, Copying from the flat, Lettering, Pen and Ink, Descriptive Geometry (Plane Surfaces).

HISTORY OF ARCHITECTURE.

Egyptian, Assyrian and Persian.

SURVEYING.

Principles, Chain Surveying, Mensuration.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Uses of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.
Acoustics : Laws of vibrating strings.
Determination of Pitch.
Velocity of Sound.
Electric Fork.
Chronograph.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching and Water Color, Pen and Ink.
Descriptive Geometry (curved surfaces).

SURVEYING.

Use of transit and level.
Mensuration.

MECHANICS.

Statics (pure and applied).
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory.

HISTORY OF ARCHITECTURE.

Greek and Roman.
Romanesque and Byzantine.

ORDERS AND ELEMENTS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

Ancient.
Classic—Greek, Roman.

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

MINERALOGY AND GEOLOGY.

Elements.

III. YEAR.

DRAWING.

Descriptive Geometry.
Shades and shadows.
Perspective.
Stone cutting.
Water Color sketching.
Original Designs—Floors, Trusses, Arches, etc.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

EXPERIMENTAL PHYSICS.

Heat, Specific Heat, Latent Heat.
Expansion of Air, Air Thermometer.
Method of Least Squares.

HISTORY OF ARCHITECTURE.

Gothic and Renaissance, with special reference to England.

HISTORY OF ORNAMENT.

Early Christian, Gothic and Renaissance.

PRINCIPLES OF DECORATION.

CHEMISTRY (APPLIED).

Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

THEORY OF CONSTRUCTION.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.
Experimental work in Engineering Laboratory.

MINERALOGY AND GEOLOGY.

Economic Geology.

METALLURGY.

Iron and Steel.

V. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists or industrial chemists, and also to furnish instruction in chemistry and its useful applications, to students of engineering and architecture, and to special students who may desire such instruction.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Plane Analytical Geometry.

MECHANICS.

Statics and Dynamics.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

DRAWING.

Copying, Lettering, Model drawing.
Descriptive Geometry.

MODERN LANGUAGES.

French.
German.

CHEMISTRY.

Elementary Chemistry.
Laboratory Work.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat. Latent Heat.
Expansion of Air. Air Thermometer.
Electricity and Magnetism.
Calculation of Elements of Terrestrial Magnetism.
Declination, Dip and Horizontal Intensity.
Tangent Galvanometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers.

MODERN LANGUAGES.

French.
German.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

CHEMISTRY.

Inorganic and Physical Chemistry
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

III. YEAR.

PHYSICS.

Thermodynamics.
Electrical Measurements.
Electric Light Photometry.
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.
Method of Least Squares.

BIOLOGY.

PHYSIOLOGY.

MINERALOGY AND GEOLOGY.

METALLURGY.

Iron, Steel, Nickel, Copper, etc.

CHEMISTRY.

Organic Chemistry and Chemical Physics.
Applied Chemistry.
Laboratory work.

THE FOURTH YEAR.

In order to provide advanced work in the various departments and also to enable students to carry on experimental work in the laboratories with less interruption from attendance at lectures and other causes than is possible in the ordinary three years course, a sessional course of instruction known as the fourth year has been established.

In order to be admitted to the fourth year a candidate must be a graduate of the School of Practical Science or an undergraduate of the standing of the fourth year in the University of Toronto in the Honor Department of Chemistry and Mineralogy.

The subjects of study in the four h year are arranged in the following groups and sub-divisions :—

A. { Astronomy.
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

Each student will be required to confine his studies during the session to one of the above groups. He will not be allowed to take less than two nor more than three of the sub-divisions in any group.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all students who select group C.

A student is liable to be called on to assist in any of the experimental and practical work in the group which he has selected, although it may not belong to his special subjects.

The groups and sub-divisions selected shall be submitted to the Council for their approval at the beginning of the session and no student will be permitted to take any subjects not so approved.

Undergraduates of the University of Toronto of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy may be admitted as students in the fourth year in the groups C and D.

Candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested by their ability to translate extracts from scientific works or periodicals not previously specified.

Courses of reading will be indicated in connection with subjects of study.

The fee for the fourth year is $54 subject to the conditions as to discounts, etc., stated on page 23.

DEGREE OF B. A. Sc.

Candidates who have fulfilled the requirements of the Fourth Year in the School of Practical Science are eligible for the degree of Bachelor of Applied Science in the University of Toronto in accordance with the following statute passed by the Senate in 1892.

By the Senate of the University of Toronto.

Be it enacted:

That the degree of Bachelor of Applied Science (B.A.Sc.) be hereby established to be granted subject to the following conditions and regulations:—

1. Candidates for the said degree shall hold the diploma of the School of Practical Science in any one of the regular courses of the said School, or shall be of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy in the University of Toronto.

2. They shall have fulfilled the conditions relating to the Fourth or Post-Graduate Year in the School of Practical Science and shall present certificates of having done so to the Registrar of the University.

3. Each candidate shall prepare a Thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University examiners. This thesis is to be accompanied by all necessary drawings, specifications, tables and estimates.

4. Candidates will be required to select two sub-divisions in any one of the following groups, and to pass such written and oral examinations on the subjects selected as may be prescribed by the University examiners.

A. { Astronomy.
   { Geodesy and Metrology.

B. { Architecture.
   { Strength and Elasticity of Materials.
   { Hydraulics.
   { Thermodynamics and Theory of Heat Engines.
   { Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all candidates who select group C.

5. Candidates are required to send to the Registrar of the University at least three weeks before the commencement of the annual examinations an application for examination according to a printed form to be obtained from the Registrar, and such application must be accompanied by a fee of five dollars.

6. The examination for the degree shall be held in May.

7. The fee for the degree shall be ten dollars and shall be paid to the Registrar not later than the first day of May.

8. The ordinary time for conferring the degree shall be at the University commencement in June. The degree may be conferred at any meeting of the Senate.

9. The thesis, drawings, and other papers accompanying them, shall be the property of the University.

10. In case any change be made in the conditions referred to in the second clause, such change shall be submitted to the Senate and shall have no force so far as the said clause is concerned unless approved by resolution of the Senate.

For further information apply to the Registrar of the University of Toronto.

DOMINION AND PROVINCIAL LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Provincial Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and Survey of Lands.

"12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects be only holden to serve as such apprentice during twelve successive months of actual service; or, in case he has received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

"(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law, and if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

"14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

"Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all the branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The attention of the Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884:—

BY THE SENATE OF THE UNIVERSITY OF TORONTO.

Be it enacted:

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C. E. be hereby established, to be granted subject to the following conditions and regulations:

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.

5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.

6. Each candidate shall prepare for the approval of the Senate, an original essay on some engineering subject, accompanied with detailed explanations, drawings, specifications and estimates; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.

7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate not later than the first day of February.

8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C.E., not later than the first day of April.

9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.

10. The examination of the essay, drawings and estimates and any further examination of the candidate that may be considered necessary, may be held in May.

11. The fee for the degree of C. E. shall be $20, and shall be paid to the Registrar not later than the first day of May.

12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.

For further information apply to the Registrar of the University of Toronto.

SYNOPSIS OF THE COURSES OF LECTURES

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT.

With Fees for Special Students.

The same discount for prompt payment will be allowed as in the case of regular students. *See p. 23.*

Special students are advised to enter at the beginning of the session (October 1st), as many subjects begun in the first term are continued through the second, and lectures cannot be repeated.

(Reductions will be made to special students taking several courses.)

☞Text-books for the first year marked (*a*); for second year (*b*); for third year (*c*), and for fourth or post graduate year (*d*).

DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference.—Davidson's Projections.
Angel's Plane and Solid Geometry.
Binn's Orthographic Projection.
Millar's Descriptive Geometry, (*a*), (*b*).
Warren's Stone Cutting (*c*).
McCord's Lessons in Mechanical Drawing.
Worthen's Topographical Drawing, (*a*), (*b*), (*c*).

Fees for Special Students, $14.

SURVEYING AND LEVELLING.

LAND SURVEYING.

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING.

Longitudinal and Cross Sections.
Plotting.

SETTING OUT.

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION.

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text-Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*), (*d*).
Henck's or Trautwine's Railway Curves (*b*), (*c*).
Johnson's Theory and Practice of Surveying.

Fees for Special Students, $14.

PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE.

The work included in this course is sufficient to fulfil the requirements of the final examination for Provincial and Dominion land surveyors.

In astronomy the principal subjects are the determination of time, latitude and azimuth, and the general principles of the methods of determining longitudes. Practical instruction is given in the methods of taking observations.

In geodesy all surveys, computations and methods of map construction are based upon the supposition that the earth is a sphere.

ADVANCED COURSE (FOURTH YEAR).

The work in this course is intended to fulfil the requirements of the final examination for Dominion topographical surveyors. It is distinguished from the work in the ordinary course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In geodesy the earth is considered as a spheroid.

Text-Books.—Gillespie's Higher Surveying (*b*), (*c*), (*d*).

Green's Spherical and Practical Astronomy (*c*), (*d*).
Chauvenet's Spherical and Practical Astronomy.
Gore's Elements of Geodesy (*c*), (*d*).
Nautical Almanac, 1894 (*c*), (*d*).

Fee for Special Students, $19.

APPLIED MECHANICS.

STATICS.

The calculation of the stresses in framed structure, solid and riveted beams, arches, etc. Both graphical and analytical methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS.

THEORY OF COMPOUND STRESS.

DESIGNING OF STRUCTURES in timber, iron and masonry—arches, retaining walls, roofs, bridges, etc.

DYNAMICS.

Representation and measurements of forces and motions.
Principles of work and energy.
Efficiency of machines. Friction.
Transmission of energy—belts, shafts, crank and connecting rod, etc.
Fly-wheels, governors.
Balancing of machinery, etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS—

Discharge of water through orifices, notches, etc. Flow in pipes and open channels. Sewerage, Water-works, Water-power, Water-wheels, Turbines, Pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE

Text-Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
Du Bois—Graphic Statics.
" Strains in Framed Structures.
Cotterill—Applied Mechanics (*a*), (*b*), (*c*), (*d*).
Rankine—Applied Mechanics (*b*), (*c*), (*d*).
Lanza—Applied Mechanics (*d*).
Unwin—Elements of Machine Design (*c*).
Shann—Elementary Treatise on Heat (*c*), (*d*).
Peabody—Thermodynamics (*d*).
" Steam Tables (*d*).
Carpenter — Experimental Engineering (*d*).
Kennedy—Mechanics of Machinery (*b*), (c).
Merriman—Hydraulics (*c*), (*d*).
Bodmer—Hydraulic Motors, Turbines, etc. (*d*).
Gerhard—House Drainage and Sanitary Plumbing (*c*).
Santo Crimp—Sewage Disposal Works.

Fees for Special Students, $19.

THEORY OF MECHANISM.

Principles of the transmission of motion without reference to force.

Pitch surfaces, spur wheels, bevel wheels, skew-bevel wheels, trains of wheelwork, teeth of wheels, cams, cranks, eccentrics, links, bands and pulleys, hydraulic connections, frictional gearing, link motion for slide valves, etc., etc.

Text-Books and Books of Reference.—Rankine—Machinery and Millwork.
Camus—Teeth of Wheels.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Cotterill—Applied Mechanics (*b*), (*c*), (*d*).

Fee for Special Students, $19.

ELECTRICITY.

Instruction will be given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University. The work will comprise :—

ELEMENTARY ELECTRICITY AND MAGNETISM.

MEASURING INSTRUMENTS—

Theory and uses in determining current, electromotive force, resistance, capacity, strength of field, magnetic inductance, etc., etc.

MATHEMATICAL THEORY OF ELECTRICITY.

APPLICATIONS OF ELECTRICITY—

Laboratory work and lectures on telegraph, telephone, dynamos, their design and construction, electric lighting ; arc and incandescent systems, storage batteries, transmission of power by electricity, etc.

THEORY OF ALTERNATING CURRENT GENERATORS AND TRANSFORMERS.

Text-Books and Books of Reference.—Kennelly & Wilkinson—Practical Notes for Electric Students (*a*), (*b*).
Stewart & Gee—Practical Physics (*b*).
Cumming—Theory of Electricity (*c*).

Thomson, S. P.—Dynamo Electric Machinery (*c*), (*d*).
Kapp—Electric Transmission of Energy (*d*).
Blakesley—Alternating Currents (*d*)

Current numbers of the "Electrican," the "Electrical World," and "La Lumiere Electrique."

Fee for Special Students, from $19 to $34.

ARCHITECTURE.

History of Architecture—

Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

Orders of Architecture.

History of Ornament.

Principles of Decoration.

Text-Books and Books of Reference.—T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Fergusson's History of Architecture.
Gwilt's Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture (*b*), (*c*).
Leed's Orders of Architecture (*b*).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.

Fee for Special Students, $19.

MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the school.

CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES BY THE PROFESSOR OF CHEMISTRY OF THE UNIVERSITY OF TORONTO.

Inorganic Chemistry.
Organic Chemistry.
Chemical Theory.
Physical Chemistry.

COURSES BY THE PROFESSOR OF APPLIED CHEMISTRY OF THE SCHOOL OF PRACTICAL SCIENCE.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuel, Furnace, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air Sewage, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis of Food, Water and Air, and Toxicology.
Fee for Special Students, $34 to $54.

MINERALOGY AND GEOLOGY.

MINERALOGY, GEOLOGY, MINING AND METALLURGY.

1. Mineralogy and Geology—
   Mineralogy and Crystallography.
   Geology and Palæontology.
   Lithology.
   Physical Geography.
   Blowpipe Analysis.
   Determinative Mineralogy.

Books of Reference.—Chapman's Mineralogy and Geology of Canada.
Dana's Manual of Geology.
Dana's System of Mineralogy.
Nicholson's Palæontology.
Geikie's Text-Book of Geology.
Plattner's Manual of Blowpipe Analysis.
Chapman's or Brush's Mineral Tables.

2. Mining and Metallurgy—

Mining Geology.
Ore Dressing.
Metallurgy of Iron and Steel.
Metallurgy of Nickel, Copper, Silver, etc.
Assaying.

Kœhler's Bergbaukunde.
Kuhnhardt's Ore Dressing.
Phillip's Ore Deposits.
Balling's Metallhuettenkunde.
Schnabel's Allgemeine Huettenkunde.
Phillip's and Bauerman's Elements of Metallurgy.
Mitchell's Assaying by Crookes.
Kerr's Probirkunst.

Fee for Special Students, $19 to $54.

VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a thesis (accompanied by drawings and specifications when necessary) during the subsequent vacation.

The engineering and architectural students will also be required to make, during the vacation, full and clear notes of various constructions that may fall under their notice.

The value of both the thesis and the construction notes will be taken into account in determining standing at the next following examination.

Civil Engineering.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.

Books of Reference.—Gilmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Mechanical and Electrical Engineering.

Subject of Thesis for Second Year.—Machine-shop Practice.
" " *Third* " Foundry Practice.

Books of Reference.—Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

Mining Engineering.

Subject of Thesis for Second Year.—Metallurgy of Iron and Steel.
" " *Third* " Ore-dressing.

Books of Reference.—Roberts-Austen.—Introduction to the Study of Metallurgy.
Bloxam—Metals.
Kuhnhardt—Ore-dressing in Europe.

Architecture.

For the second year the following set of freehand pencil sketches will be required:—

I. Doorway from the object;
II. Staircase " "
III. Arched bridge (stone) from the object;

And seven sheets from the object, prints or drawings, with plans and sections where possible.

Subject of the Thesis for the Second Year.—The above sketches.
" " *Third* " Sanitary Drainage.

Books of Reference for Third Year.—Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Subject of Thesis for Second Year.—Sulphuric Acid and Alkali Manufacture.

" " *Third* " Coal Tar Products.

Books of Reference—Lunge—Manufacture of Sulphuric Acid and Alkali.
Wagner—Chemical Technology.
Thorpe—Dictionary of Applied Chemistry.

Any other works on the above subjects may be consulted and results of original observations should be given.

ENGINEERING LABORATORY.

This Laboratory occupies two floors, having a total area of 10,000 square feet. It consists of three departments, viz. :

(*a*) The department for testing materials of construction.

(*b*) The department for investigating the principles governing the application of power. This department is sub-divided into the steam laboratory, the hydraulic laboratory and electrical laboratory.

(*c*) The department for investigating problems connected with standards of length, time, astronomical observations, etc.

In order to prepare specimens for the testing machines, a shop has been fitted up with a number of high-class machine tools specially suited for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labor. It is also supplied with the necessary appliances for making ordinary repairs.

The machines in the department for testing materials are the following :—

An Emery 50-ton machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A Riehle 100-ton machine for making tests in tension, compression, shearing and cross-breaking. It will take in posts twelve feet long and beams up to eighteen feet in length.

An Olsen torsion machine for testing the strength and elasticity of shafting. This machine will twist shafts up to sixteen feet in length and two inches in diameter.

A Riehle 2,000 pounds cement testing machine. The cement testing room is fitted with all the usual accessories.

The equipment of the power department is as follows :—

A Babcock and Wilcox 52-horsepower boiler.

A Harrison Wharton 12-hor epower boiler.

A 50-horsepower Brown machine. This engine was constructed specially for experimental investigation. It is steam jacketted and has three alternative exhausts, to the open air, to a jet condenser, and to a Wheeler surface condenser, kindly presented to the School by Mr. F. M. Wheeler of New York, the inventor.

There are also a Blake circulating pump, a Knowles air pump and a Blake feed pump, the latter of which was a gift from the manufacturers.

A machine for testing lubricating oils and measuring journal friction, built by Riehle Bros., of Philadelphia.

The hydraulic division of the laboratory is furnished with a three-throw pump with double acting cylinders. It has a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices and weirs, measuring tanks, etc. A three feet jet turbine forms a part of the same equipment.

The electrical division of the laboratory is equipped with the following dynamos :—

Edison, Ball, Thomson-Houston, two Gulcher machines, a Westinghouse alternator with transformers, a Crocker-Wheeler and a Kay motor, also two small fan motors.

There are also a Roberts storage battery, a gravity primary battery and a good equipment of lamps, arc and incandescent, of different types.

The power department is equipped with the usual measuring instruments, indicators, gauges, gauge testing apparatus, scales, brakes, dynamometers, a variety of electrical measuring apparatus, including a Thomson electrical balance.

The shafting is driven by a 7-horsepower Otto gas engine, and by the Brown Engine above described.

In the geodetic and astronomical department are a 100 feet and a 66 feet standard of length ; a 10 foot Rogers comparator with graduating attachment ; a Howard astronomical clock and electro-chronograph ; a Troughton & Simms 10 inch theodolite and all the ordinary surveying instruments.

THE CHEMICAL LABORATORIES.

The chemical laboratories comprise a laboratory for qualitative analysis with accommodation for 40 students working at one time, a laboratory for quantitative analysis capable of accommodating 20 students and smaller rooms for special work such as water analysis, technical gas analysis, etc. The laboratories are fitted with the usual appliances.

BLOWPIPE AND ASSAYING LABORATORIES.

Six rooms are provided in this department, including a blowpipe laboratory with tables and other appliances for fifteen students ; an assaying laboratory with gas and charcoal furnaces ; a balance room, titration laboratory and store-rooms, with the equipment necessary for wet and dry assays.

PHYSICAL LABORATORY.

(University of Toronto.)

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of mechanics, sound, light, heat and electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an elementary laboratory, there are several special laboratories, which offer unusual facilities for the conduct of experiments in the various branches of physics.

The electrical apparatus includes electrometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre), Ruhmkorff coils, Crooke's tubes, telephones, etc., etc.

MODERN LANGUAGES.

No special examinations are held in these languages except in the Fourth Year, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARIES, MUSEUMS, Etc.

The Library, Museums and Herbarium of the University of Toronto are open to regular students. The library fee is $2 per annum, payable in advance.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1892-3.

President.....W. A. Lea, Grad. S.P.S.
Vice-President.....A. J. McPherson.
Secretary.....J. Chalmers.
Treasurer.....H. H. Gibson.
Corresponding Secretary.....J. Keele.
Librarian.....W. Fingland.
Representatives—Graduates.....E. B. Merrill, Grad. S.P.S., B.A.
Third Year....G. L. Brown.
Second Year...A. T. Fraser.
First Year....A. E. Blackwood.

The Society meets every second Wednesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

ALUMNI ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1892.

President.....J. Galbraith, M.A.
First Vice-President...J. H. Kennedy, C.E.
Second Vice-President.G. Mickle, B.A.
Councillors.....H. J. Bowman, O.L.S.
W. L. Innes, O.L.S.
A. L. McCulloch, O.L.S.
G. E. Silvester, O.L.S.
R. W. Thomson.
Secretary-Treasurer...J. A. Duff, B.A.

Graduates are requested to keep the Secretary acquainted with their addresses.

SESSION 1892-3.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

DEPARTMENT OF CIVIL ENGINEERING.

1st Year.

Adams, J. C.
Armstrong, J.
Black, C. A.
Crews, H. R.
Fitzsimons, H.
Guernsey, F. A.
Handy, E. F.
Hewett, C. H.
Johnson, G.
Lapp, A. H.
Meadows, W. W.
Poussette, H. R.
Self, Geo.
Tye, A. T.
Webster, E. B.

2nd Year.

Boswell, E. J.
Bergey, A. E.
Burton, T.
Chalmers, J.
Dobie, J. S.
Fraser, A. T.
Gibson, H. H.
Gordon, J. P.
Jones, J. E.
Johnson, S. M.
Moore, H. H.
McTaggart, A. L.
Robinson, F. J.
Rolph, H.
Sims, H, B.
Shields, J. D.

3rd Year.

Ardagh, J. A.
Brown, G. L.
Charlesworth, L. C.
Dunn, T. H.
Francis, W. J.
Fairbairn, J. M.
Forester, C.
Laidlaw, J. T.
McPherson, A. J.
McFarlen, T. J.
Mines, W.
Main, W. T.
McAllister, A. L.
Marani, V. G.
Macallum, A. F.
Russel, R.
Speller, F. N.
Squire, R. H.
Smith, A.
Taylor, W. V.
Watson, R. B.

DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

1st Year.

Beatty, D. H.
Blackwood, A. E.
Fowler, C. P.
Gray, R. L.
Oliver, O. S.
Patterson, G. E.

Blachford, W. A.
Brown, R. M.
Brown, L. L.
Bell, A.
Brodie, W. M.
Brebner, Geo.
Doyle, F. M.
Elliott, H.
Helliwell, W. L.
Harman, O. E.
Hull, H. S.
Hudspeth, E.
McKay, W. N.
McKechnie, R. S.
McKinnon, H. L.
Mullins, C. B.
Ridout, C.
Stocking, F. T.
Tremaine, R. C. C.
Taylor, H. P.
Wood, H. T.
Wickson, F. R.
Wade, H. R.
Watson, J. W.

2nd Year.

Angus, R. W.
Boyd, D. G.
Beauregard, A. T.
Bucke, W. A.
Hanly, J. B.
Herald, W. J.
Job, H. E.
Johnston, A. C.
Lash, N. M.
Minty, W.
Nicholson, C. J.
Spotton, A. K.
Wright, R. T.

3rd Year.

Goldie, A. R.
Hanly, S. C.
Lash, F. L.
Robertson, J. M.
Robertson, C. G.

DEPARTMENT OF ARCHITECTURE.

1st Year.

Band, C. P.
Campbell, R. J.
Clark, J. T.
Ellis, Miss K. M.
Harkness, A.
Morphy, E. J.
Murray, D. B.

2nd Year.

Ewart, J. A.
Williams, R. E.

3rd Year.

Ballantyne, H. F.
Fingland, W.
Keele, J.

DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

1st Year.

Smith, V. S.

FOURTH OR POST-GRADUATE YEAR.

Alison, T. H.
James, D. D.
Laing, A. T.
Laschinger, E. J.
McEntee, B.
Prentice, J. M.
Thomson, R. W.
Lea, W. A.
Milne, C. G.
McAree, J.
Law on, W.

SPECIAL STUDENTS.

CIVIL ENGINEERING.

Bloy, M.
Cameron, G. B.
Love, H. H.
McCollum, T. E. B.
Troup, G. E.

MECHANICAL AND ELECTRICAL ENGINEERING.

Douglas, G. M.
Fenwick, H. E.
Lea, E. P.
Postlethwaite, F.
Shipe, R. R.
Wilson, F. J.
Anderson, D. B.
Sifton, E. I.

MINING ENGINEERING.

Mabee, H. C.
Dewar, T. R.
Evans, R. B.

ARCHITECTURE.

Burritt, C. J.
Bellsmith, F. M.
Walker, J.
Ross, A. J.
Meredith, C. P.

Chemistry—
Hagarty, H. J.

DRAWING.

Falk, T. E.
Laxton, J. E.

CHEMISTRY AND MINERALOGY.

Wallbridge, C. M.
Liddy, W. R.
Wilson, A. G.

PRIZEMEN.

Engineering.

1879.—	I. Year	J. McAree	1st prize.
1880.—	II. Year	J. L. Morris	1st prize.
1881.—	I. Year	G. H. Duggan	1st prize.
	II. Year	D. Jeffrey	1st prize.
1882.—	I. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	II. Year	G. D. Duggan	1st prize.
	III. Year	D. Jeffrey	1st prize.
1883.—	I. Year	B. A. Ludgate	1st prize.
	" "	A. M. Bowman	2nd prize.
	II. Year	A. R. Raymer	1st prize.
	" "	E. W. Stern	2nd prize.
	III. Year	G. H. Duggan	1st prize.
1884.—	II. Year	B. A. Ludgate	1st prize.
	III. Year	E. W. Stern	1st prize.
	" "	A. R. Raymer	2nd prize.
1885.—	I. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
	II. Year	T. K. Thomson	1st prize.
	III. Year	B. A. Ludgate	1st prize.
1886.—	I. Year	C. H. C. Wright	1st prize.
	" "	J. E. Ross	2nd prize.
	II. Year	A. E. Lott	1st prize.
1887.—	I. Year	H. E. T. Haultain	1st prize.
	II. Year	C. H. C. Wright	1st prize.
	III. Year	A. E. Lott	1st prize.
	" "	J. Roger	2nd prize.
1888.—	I. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	II. Year	D. D. James	1st prize.
	III. Year	C. H. C. Wright	1st prize.

1889.—	I. Year	J. K. Robinson	1st prize.
	" "	G. E. Silvester	2nd prize.
	II. Year	E. B. Merrill	1st prize.
	" "	F. M. Bowman	2nd prize.
	III. Year	D. D. James	1st prize.
1890.—	I. Year	C. Fairchild	1st prize.
	II. Year	J. K. Robinson	1st prize.
	III. Year	F. M. Bowman	1st prize.
	" "	F. B. Merrill	2nd prize.
1891.—	I. Year	A. J. McPherson	1st prize.
	" "	R. B. Watson	2nd prize.
	II. Year	J. B. Goodwin	1st prize.
	III. Year	G. E. Silvester	1st prize.
	" "	C. W. Dill	2nd prize.
1892.—	I. Year	A. E. Bergey	1st prize.
	" "	R. W. Angus	2nd prize.
	II. Year	A. J. McPherson	1st prize.
	" "	R. B. Watson	2nd prize.
	III. Year	E. J. Laschinger	1st prize.
	" "	C. Fairchild	2nd prize.

ARCHITECTURE.

1891.—	I. Year	H. Ballantyne.	
1892.—	I. Year	J. A. Ewart.	

UNIVERSITY OF TORONTO.

DEGREE OF C. E.

Date of Admission.	
1885	J. L. Morris.
1886	J. H. Kennedy.
1889	J. W. Tyrrell.
1892	T. K. Thomson.
1892	H. J. Chewett.
1893	W. L. Innes.
1893	F. M. Bowman.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

CIVIL ENGINEERING.

1881.—Morris, J. L., C.E., O.L.S.,
Pembroke, Ont.

1882.—Jeffrey, D., Contractor,
Stratford, Ont.
Kennedy, J. H., C.E., O.L.S., Architect, etc.,
Resident Engineer, Sault Line, Shedden, Ont.
McAree, J., O.L.S., D.T.S.,
School of Practical Science, Toronto (Post-graduate course).

1883.—Burns, D., O.L.S.,
Engineer's Staff, Pennsylvania Co., Pittsburgh, Pa.
Duggan, G. H.,
Chief Engineer, Dominion Bridge Co., Montreal.
Tyrrell, J. W., C.E., O. and D.L.S.,
Hamilton, Ont.

1884.—Kirkland W. C.,
Illinois Central Ry., New Orleans, La.
McDougall, J., B.A.,
County Engineer, Toronto.
Raymer, A. R.,
Engineer's Office, Lake Shore and Michigan Southern R. R.,
Toledo, Ohio.
Robertson, J., O.L.S.,
Coad & Robertson, Civil Engineers, P. L. Surveyors, etc.,
Glencoe, Ont.
Stern, E. W.,
Engineer Scharpe & Kohen Architectural Iron Co., St. Louis,
Mo.

1885.—Bleakley, F. W.,
Seattle, W. T.
Bowman, H. J., D. and O.L.S.,
Town Engineer, Berlin, Ont.
Henderson, E. E., O.L.S.,
Henderson P.O., Piscatiquois, Me.

1885.—Ludgate, B. A., O.L.S.,
Peterboro', Ont.
McKay, O., O.L.S.,
Windsor, Ont.

1886.—Bowman, A. M., D. and O.L.S.,
Staff U. S. Engineers, Ohio River Improvement, Vanport, Pa.
Hermon, E. B., O. and D.L.S.,
Gordon, Hermon & Burwell, Vancouver, B.C.
Laird, R., O.L.S.,
City Surveyor's Office, City Hall, Toronto.
Thomson, T. K., C.E.,
Crane Dept., Yale & Towne, Stamford, Conn.
Tyrrell, H. G.,
Berlin Iron Bridge Co., East Berlin, Conn.

1887.—Burns, J. C. (Deceased).
Lott, A. E.,
Yuma, A. T.
McCullough, A. L, O.L.S.,
Resident Sewerage Engineer, West Toronto Junction.
Martin, F., O.L.S.,
University Medical College, Toronto, Ont.
Pinhey, C. H., O. and D.L.S.,
Soulanges Canal, Coteau Landing.
Roger, J., O L.S.,
Mitchell, Ont.

1888.—Apsey, J. F., O.L.S.,
242 W. Biddle St., Baltimore, Md., U.S.
Ashbridge, W. T.,
City Engineer's Office, Toronto.
Ball, E. F., A.M. Can. Soc. C.E.,
Chief Sanitary Inspector, Medical Health Office, Toronto.
Brown, D. B., O.L.S.,
Mexican Southern Railway, Old Mexico.
Canniff, C. M.,
City Surveyor's Office, Toronto.
Chewett, H. J., C.E., A.M. Can. Soc. C.E.,
Poplar Plains Road, Toronto.
Gibbons, J., O.L.S.,
Alaska Boundary Survey.

1838.—McDowall, R., O.L.S.,
Owen Sound, Ont.
McFarlen, G. W., O.L.S.,
County Surveyor's Office, Toronto.
Marani, C. J.,
Canada Permanent Loan Co., Vancouver.
Mickle, G. R., B.A.,
Mining Engineer, Sudbury, Ont.
Moore, J. H., O.L.S.,
Smith's Falls, Ont.
Richardson, G. H.,
Bucke, Haultain & Richardson, Consulting, Mining and Electrical Engineers, Kaslo, Kootenay, B.C.
Rose, K.,
Mexican Southern Railway, Tonilla, Est-de-Jalisco, Mexico.
Ross, J. E., O.L.S.,
Riverside, Cal.
Wright, C. H. C., B.A. Sc.,
Lecturer in Architecture, S.P.S., Toronto.

1889.—Carey, B.,
Engineer's Office, Toronto, 30 Russell St.
Chalmers, W. J.,
Engineer's Staff, Peoria and Eastern Ry., Union Depot, Indianapolis.
Clement, W. A.,
City Engineer's Office, Toronto.
Hanning, G. F.,
City Engineer's Office, Toronto.
Haultain, H. E. T.,
Bucke, Haultain & Richardson, Consulting Mining and Electrical Engineers, Kaslo, Kootenay, B.C.
Irvine, J.,
Harriston, Ont.
James, D. D., O.L.S.,
19½ Richmond St. E., Toronto.
Mill, F. X.,
City Engineer's Office, Brockville.
Moberly, H. K.,
Frostburg, Va., U.S.A.
Rosebrugh, T. R., M.A.,
Lecturer in Electrical Engineering, S.P.S., Toronto.
Wickett, T.,
Toronto University.

1890.—Bowman, F. M., O.L.S., C. E.,
Chief Draftsman, Riter & Conley, Alleghany, Pa.
Bucke, M. A.,
Bucke, Haultain & Richardson, Consulting, Mining and Electrical Engineers, Kaslo, Kootenay, B.C.
Corrigan, C. D.,
Box 292, Vancouver, B.C.
Duff, J. A., B.A.,
Fellow in Engineering, S.P.S., Toronto.
English, A. B.,
Manufacturing Works, Port Colborne, Ont.
Garland, N. L.,
Eglinton, Ont.
Hutcheon, J., O.L.S.,
Guelph, Ont.
Innes, W. L., O.L.S., C. E.,
Assistant Resident Engineer C.P.R., London, Ont.
Merrill. E. B.,
Toronto Technical School, Fellow in Mechanical Engineering, S.P.S., Toronto.
Pedder, J. R., O.L.S.,
J. Galt, C.E., Toronto.
Wiggins, T. H., O.L.S.,
Saunders & Wiggins, Civil Engineers and Surveyors, Brockville, Ont.
Withrow, W. J.,
Fetherstonhaugh & Co., Toronto.

1891.—Beatty, H. J., O.L.S.,
Engineer's Staff, Atlantic & N. W. Division C.P.R., Pembroke, Ont.
Deacon, T. R., O.L.S.,
Rat Portage, Ont.
Dill, C. W.,
Staff of Willis Chipman C. E., 21 Wood St., Toronto.
Lane, A.,
Fellow in Surveying, S.P.S., Toronto.
McAllister, J. E.,
Dominion Bridge Co., Montreal, P.Q.
Moore, J. E. A.,
Engineer's Staff D. & W. Ry., Duluth, Minn.
Newman, W., O.L.S..
Maycock & Newman, Windsor, Ont.

1891.—Robinson, J. K., Deceased.
Russel, W.,
Hall's Bay Ry., Newfoundland.
Silvester, G. E., O.L.S.,
Peoria and Eastern Ry., Union Depot, Indianapolis.
Symmes, H. D.,
Engineer Street Ry, St. Catharines, Ont.
1892.—Allan, J. R,
Renfrew, Ont.
Alison, T. H.,
School of Practical Science, Toronto, (Post-graduate course).
Anderson, A. G.,
Boston Bridge Co., 61 Hancock St., Boston, Mass.
Fairchild, C.,
City Engineer's Office, Brantford, Ont.
Goodwin, J. B.,
City Engineer's Staff, Niagara Falls, N. Y.
Laschinger, E. J.,
School of Practical Science, Toronto, (Post-graduate course).
Laing, A. T.,
School of Practical Science, Toronto, (Post-graduate course).
McEntee, B.,
School of Practical Science, Toronto, (Post-graduate course).
Mitchell, C. H.,
City Engineer's Office, Niagara Falls, N. Y.
Playfair, N. L.,
Hall Signal Co., Baltimore, Md.
Prentice, J. M.,
School of Practical Science, Toronto, (Post-graduate course).
Ross, J. A.,
Engineer's Staff, L. S. & M. S. Ry., Toledo, O.
Smith, A.,
Engineer's Staff, D. & W. Ry., Duluth, Minn.
Thomson, R. W.,
School of Practical Science, Toronto, (Post-graduate course).
Toronto Technical School.

MECHANICAL AND ELECTRICAL ENGINEERING.

1890.—Ross, R. A.,
Engineer Edison Electric Co., Peterboro', Ont.
1891.—Merrill, E. B.
Toronto Technical School, Fellow in Mechanical Engineering, S. P. S., Toronto.

1892.—Lea, W. A.,
School of Practical Science. Toronto, (Post-graduate course).
Milne, C. G.,
School of Practical Science, Toronto, (Post-graduate course).
White, A. V.,
Woodstock, Ont.

ARCHITECTURE.

1892.—Langley, C. E.,
Langley & Langley, Architects, Toronto.

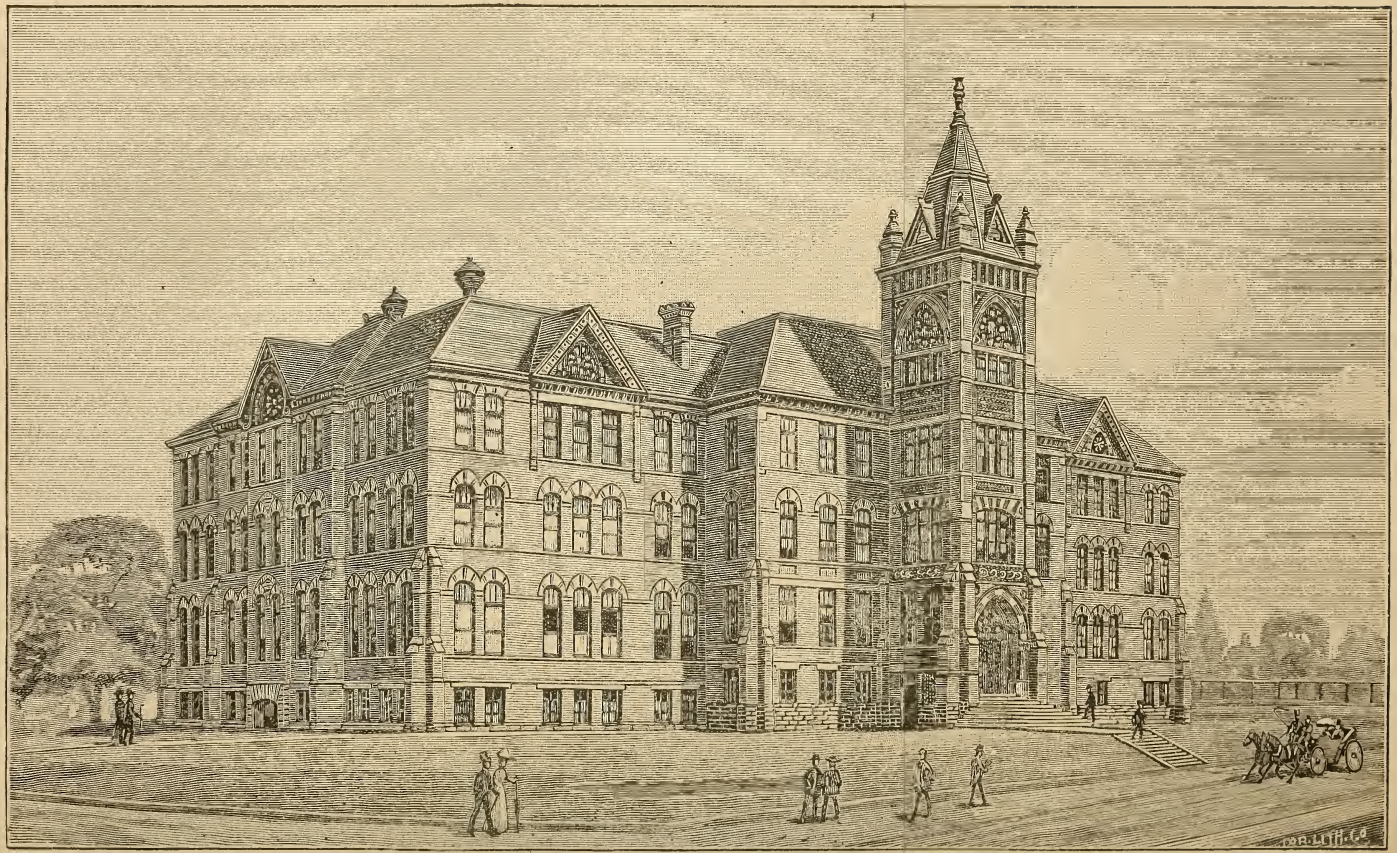
ANALYTICAL AND APPLIED CHEMISTRY.

1890.—Boustead, W. E., B.A.Sc..
Fellow in Metallurgy and Assaying, S. P. S., Toronto.

1891.—James, O. S.,
102 Howard St., Toronto, Ont.

1892.—Lawson, W.,
School of Practical Science, Toronto, (Post-graduate course).

[Frontispiece.]



SCHOOL OF PRACTICAL SCIENCE, TORONTO.

CALENDAR

OF THE

School of Practical Science,

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and the Regulations for Diplomas.

17th SESSION **1894-1895.**

TORONTO:
PRINTED BY WARWICK BROS. & RUTTER, 68 AND 70 FRONT STREET, WEST.
1894.

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1894.

SEPTEMBER

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	..	..	..	..	..	..

21. Meeting of Council.
26 **Entrance Examinations** begin.

OCTOBER.

SUN.	MON.	TUE	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	**17**	18	19	20
21	22	23	24	25	26	27
28	29	30	**31**	..	..	..
..	..	..	..	..	..	..

1. **FIRST TERM** begins.
2. Supplemental Examinations begin.
12. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	**14**	15	16	17
18	19	20	21	22	23	24
25	26	27	**28**	29	30	..
..	..	..	..	..	..	..

9. Meeting of Council.

1895.

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	**12**	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	..	..	..	..	..

14. Meeting of Council.
21. **FIRST TERM** ends.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	1	2	3	4	5
6	7	8	**9**	10	11	12
13	14	15	16	17	18	19
20	21	22	**23**	24	25	26
27	28	29	30	31	..	..
..	..	..	..	..	..	..

8. **SECOND TERM** begins.
11. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	**6**	7	8	9
10	11	12	13	14	15	16
17	18	19	**20**	21	22	23
24	25	26	27	28	..	..
..	..	..	..	..	..	..

8. Meeting of Council.
27. Ash Wednesday. Building closed.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	**6**	7	8	9
10	11	12	13	14	15	16
17	18	19	**20**	21	22	23
24	25	26	27	28	**29**	30
31	..	..	..	..	..	..

8. Meeting of Council.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	..	..	..	..
..	..	..	..	..	..	..

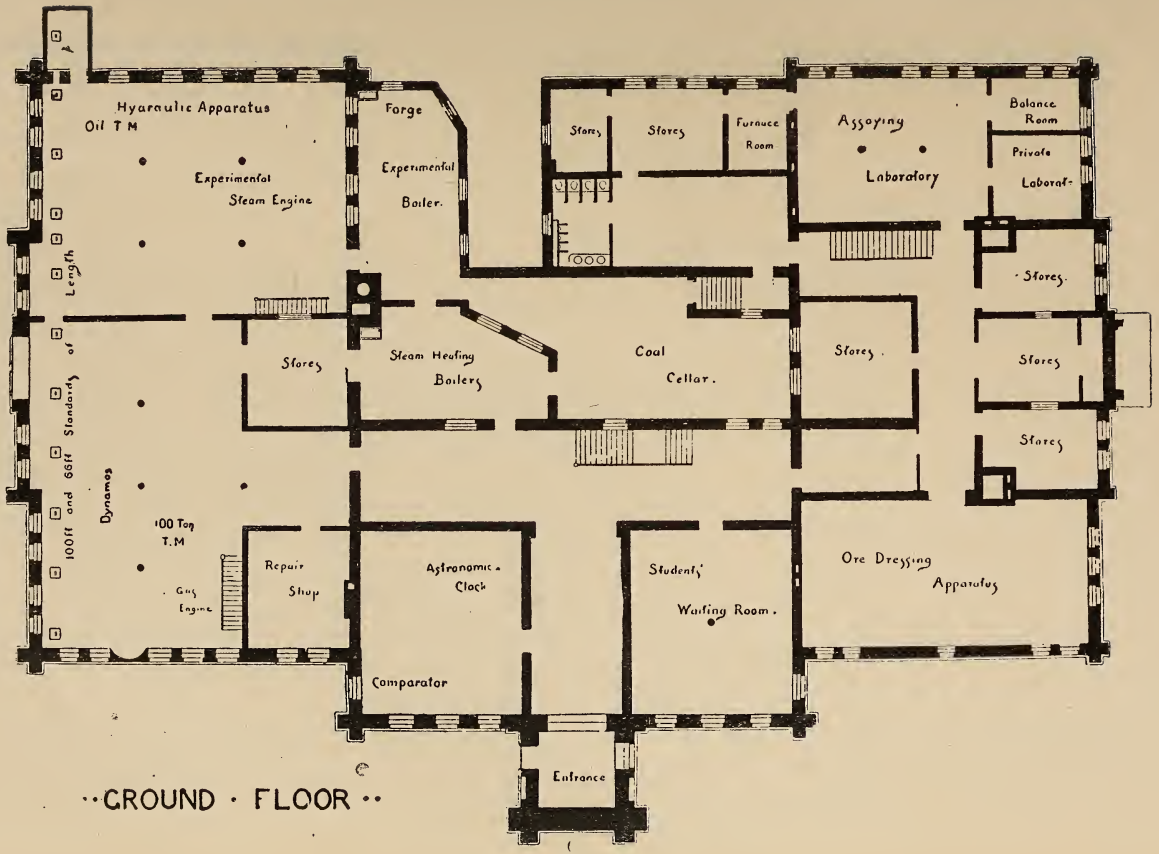
8. Lectures and Practical Work close.
11. Meeting of Council.
12. Good Friday. Bdg. closed.
15. **Examinations begin.**

MAY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	..
..	..	..	..	..	..	..

1. **SECOND TERM** ends.

Black figures denote meetings of Engineering Society.



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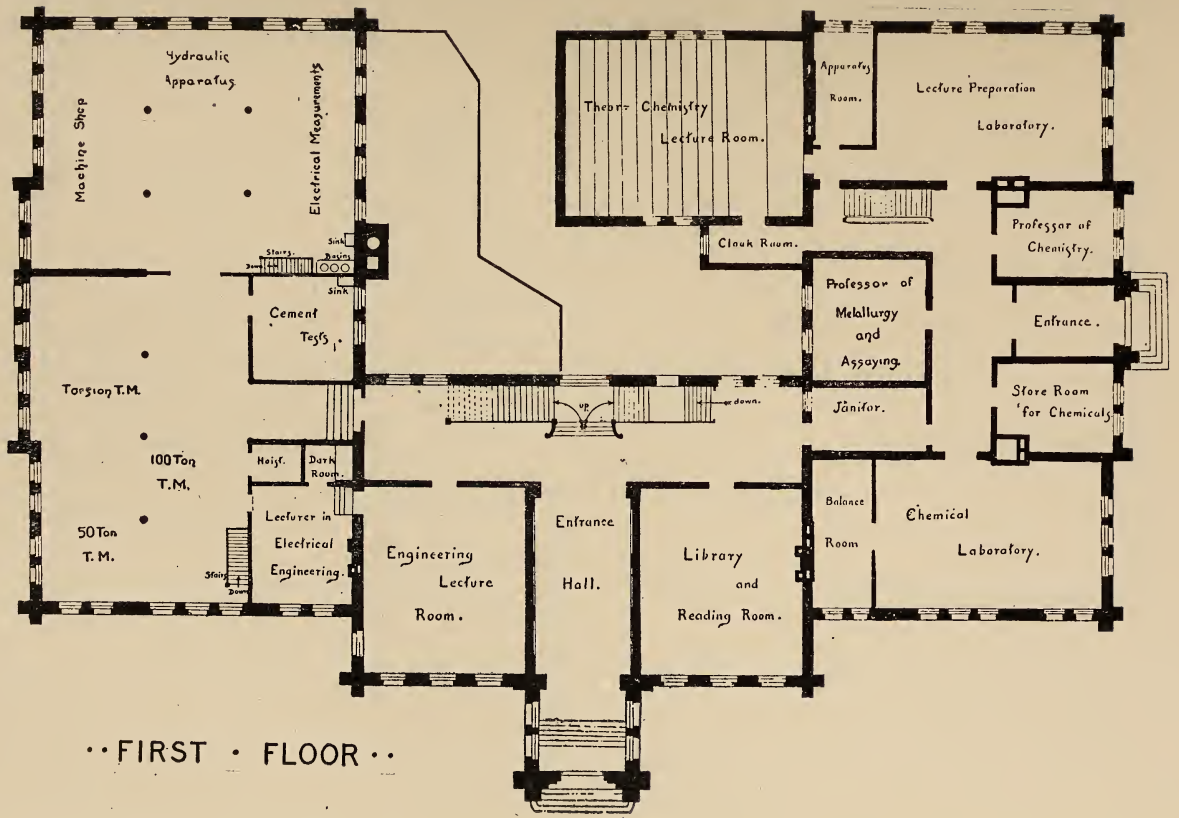
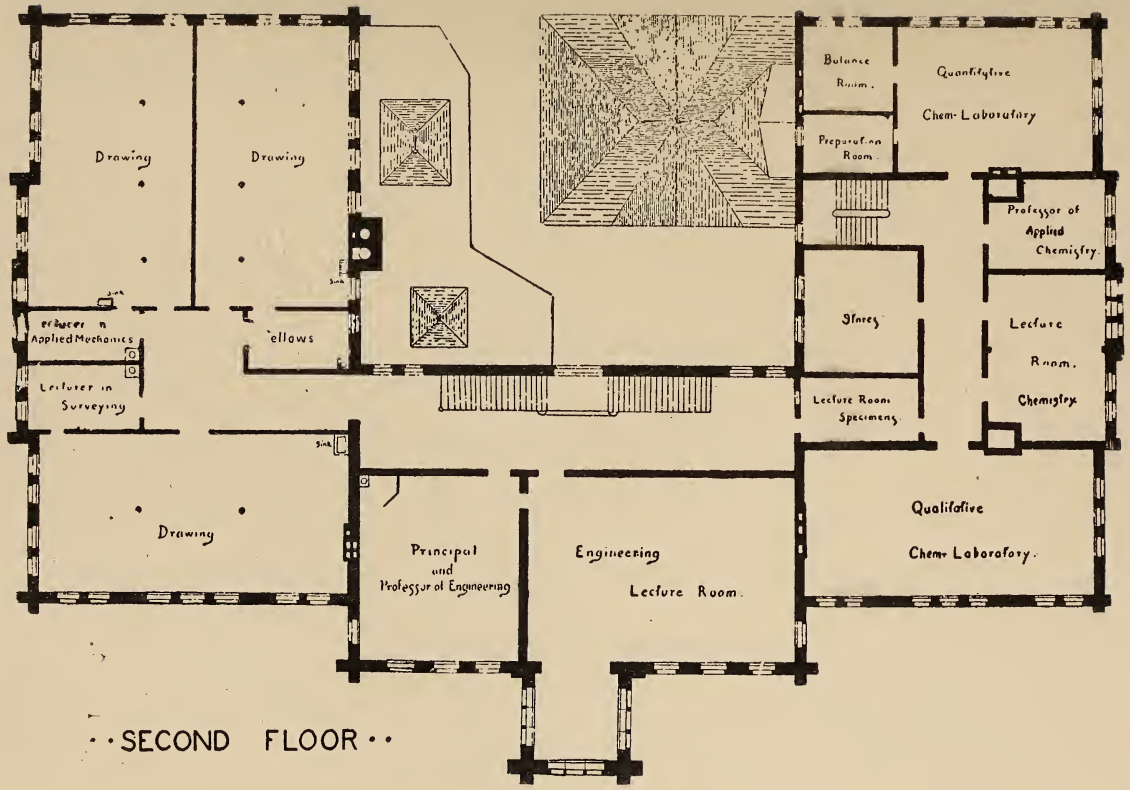

Hydraulic Apparatus
Machine Shop
Electrical Measurements
Stairs.
Sink
Basins
Sink
Cement Tests
Torsion T.M.
100 Ton T.M.
50 Ton T.M.
Hoist.
Dark Room.
Lecturer in Electrical Engineering.
Stairs
Down
Engineering Lecture Room.
Entrance Hall.
Library and Reading Room.
Theor. Chemistry Lecture Room.
Apparatus Room.
Lecture Preparation Laboratory.
Cloak Room.
Professor of Chemistry.
Professor of Metallurgy and Assaying.
Entrance.
Janitor.
Store Room for Chemicals
UP
down.
Balance Room
Chemical Laboratory.

FIRST · FLOOR


Drawing
Drawing
Lecturer in Applied Mechanics
Fellows
Lecturer in Surveying
Drawing
Principal and Professor of Engineering
Engineering Lecture Room
Balance Room
Quantitative Chem. Laboratory
Preparation Room
Professor of Applied Chemistry
Stores
Lecture Room
Chemistry
Lecture Room Specimens
Qualitative Chem. Laboratory
SECOND FLOOR

Dais.
Assembly
Hall.
Museum.
Toxicological
Laboratory.
Laboratory for
Sanitary
Chemistry.
Lecture
Room
Mineralogy
and
Geology
Museum.
Architectural
Lecture Room.
Drawing.
Lecturer
in
Architecture.

THIRD · FLOOR

TIME TABLE—FIRST YEAR—SESSION 1894-95.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	* Analytical Geometry, 1, 2, 3, 4 Chemical Lab'y, 5	* Euclid.	* Trigonometry.	* Algebra.	* Trigonometry.	9-10
10-11	* Elect'y & Magn'm, 3, 5 (*a*) Drawing, 1, 2, 4 do 3, 5 (*b*)	* Elemt'y Mechanics, 5 (*a*) Statics, 1, 2, 3, 4 Drawing, 5 (*b*)	* Acoustics, 4 (*a*) History of Arch'e, 4 (*b*) Electricity, 3, 5 (*b*) Drawing, 1, 2 do 3, 5 (*a*)	* Elemt'y Mechanics, 5 (*a*) Statics, 1, 2, 3, 4 Drawing, 5 (*b*)	* Elect'y & Magn'm, 3, 5 (*a*) Electricity, 3, 5 (*b*) History of Arch'e, 4 Drawing, 1, 2	10-11
11-12	Drawing.	* Chemistry.	* Chemistry.	* Chemistry.	Pen and Ink 4 Drawing, 1, 2, 3, 5	11-12
12-1	Drawing.	Dynamics, 1, 2, 3, 4 Drawing, 5	Descriptive Geometry.	Surveying, 1, 2, 3, 4 Drawing, 5	Drawing	12-1
1-2						1-2
2-3	Chemical Lab'y. Drawing.	* Physical Lab'y 3, 5 (*a*) Field Work 1, 2, 4 (*a*) Chemical Lab'y 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y. Drawing.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	2-3
3-4	Chemical Lab'y. Drawing.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y. Drawing.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	3-4
4-5	Chemical Lab'y. Drawing.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y. Drawing.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	4-5

1, Civil Engineering; 2. Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture: 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term (*b*) Second Term. Subjects not numbered are common to all the departmen s. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—SECOND YEAR—SESSION 1894-95.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	Rigid Dynamics 1, 2, 3 History of Arch'e, 4	Surveying (Lect.) 1,2,4 Electricity, 3	* Calculus, 1, 2, 3, 4	* Astronomy, 1, 2 Electricity, 3 History of Ornam't, 4	* Calculus, 1, 2, 3, 4	9-10
10-10	* Optics. (*b*) Spherical Trig'y 1, 2, 3 (*a*) Drawing, 4 (*a*)	* Hydrostatics. (*b*) * Heat. 5 (*b*) Metallurgy. (*a*)	Descriptive Geo 1,2,3,4	* Hydrostatics. (*b*) * Heat, 5 (*b*) Metallurgy. (*a*)	* Optics. (*b*) Spherical Trig'y, 1,2,3 (*a*) Drawing, 4 (*a*)	10-11
11-12	* Inorganic Chem'y 5 Mineralogy & Geology, 1, 2, 4, 5 Theory of Mech'ism, 3	Chemical Lab'y. Drawing.	Mineralogy and Geology, 1, 2, 4, 5 Theory of Mech'ism, 3	Drawing, 1, 2, 4 Electrical Lab'y, 3	* Inorganic Chem'y, 5 Pen and Ink, 4 Drawing, 1, 2, 3	11-12
12-1	Strength of Materials, 1, 2, 3, 4	Chemical Lab'y. Drawing.	Strength of Materials, 1, 2, 3, 4	Drawing, 1, 2, 4 Electrical Lab'y, 3	Drawing, 1, 2, 3,4	12-1
1-2						1-2
2-3	Mineralogical Lab'y 1,2 Electrical Lab'y, 3 Drawing, 4	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Orders of Arch'e, 4 Drawing, 1, 2 do 3 (*b*)	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y. (*b*) Field Work, 1, 2, 4 (*a*) Drawing. (*b*)	2-3
3-4	Mineralogical Lab'y 1,2 Electrical Lab'y, 3 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y. (*b*) Field Work, 1, 2, 4 (*a*) Drawing. (*b*)	3-4
4-5	Mineralogical Lab'y 1,2 Electrical Lab'y, 3 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Drawing. 1, 2, 4 do 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y. (*b*) Field Work, 1, 2, 4 (*a*) Drawing. (*b*)	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—THIRD YEAR—SESSION 1894-95.

Hours.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Hours.
9-10	* Biology, 5 Thermodynamics, 1,2,3 Drawing, 4	Hydraulics, 1, 2, 3, 4	* Biology, 5 Thermodynamics 1,2,3 Plumbing, Heating, and Ventilation, 4	Hydraulics, 1, 2, 3, 4	* Biology, 5 Compound Stress, 1, 2, 3, 4	9-10
10-11	Drawing, 1, 2, 3, 4	Astronomy and Geodesy, 1, 2 Machine Design, 3 History of Arch'e, 4	Mineralogical Lab'y, 1, ?, 5 (*a*) Assaying, 2 (*b*) Drawing, 3, 4 do 1 (*b*)	Astronomy and Geodesy, 1, 2 Machine Design, 3 History of Architecture, 4	Drawing, 1, 2, 3, 4	10-11
11-12	Drawing, 1, 2, 3, 4	Constructive Design, 1, 2, 3, 4	Mineralogical Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Drawing, 3, 4 do 1 (*b*)	Descriptive Geometry, 1, 2, 3, 4 (*a*) Theory of Least Squares, 1, 2, 3 (*b*) Pen and Ink, 4 (*b*)	Drawing, 1, 2, 3, 4	11-12
12-1	Applied Chemistry.	Mineralogy and Geology, 1, 2, 4, 5 Mechanics of Machinery, 3	Mineral'l Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Principles of Dec'n, 4 Drawing, 3 do 1 (*b*)	Mineralogy and Geology, 1, 2, 4,5 Electricity, 3	Applied Chemistry.	12-1
1-2						1-2
2-3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*)	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Constructive Design, 1, 2, 3, 4	* Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 2, 4 (*b*) Field Work, 1, 2, 4 (*a*) Mining & Ore-dres'g, 2 (*b*) Drawing, 3 (*b*)	2-3
3-4	* Physical Lab'y, 3, 5 (*a*) * Organic Chemistry, 5 Drawing, 1, 2, 4 do 3 (*b*)	* Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 2, 3, 4	* Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 2, 4 (*b*) * Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	3-4
4-5	* Physical Lab'y, 3, 5 (*a*) Surveying (Lect.) 1,2,4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 2, 3, 4	Field Work, 1, 2, 4 (*a*) Electrical Lab'y. 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 2, 4 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry, *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments, In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—FOURTH OR POST-GRADUATE YEAR.

There is no regular time-table for the work of this year. The time of the students is spent almost wholly in the engineering, chemical, and assaying laboratories. The hours are from 9 a.m. to 5 p.m. every working day during the session. Lectures are given at such intervals as may suit the laboratory work.

FACULTY OF THE SCHOOL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., *Professor of Engineering (Chairman).*
W. H. ELLIS, M.A., M.B. ..... *Professor of Applied Chemistry.*
A. P. COLEMAN, M.A., Ph.D. ..... *Professor of Assaying and Metallurgy.*
L. B. STEWART, P.L.S., D.T.S. ..... *Lecturer in Surveying (Secretary).*
C. H. C. WRIGHT, B.A.Sc. ..... *Lecturer in Architecture.*
T. R. ROSEBRUGH, M.A., Grad. S.P.S. *Lecturer in Electrical Engineering.*
* ..... *Lecturer in Applied Mechanics.*

ASSISTANT INSTRUCTORS.

J. A. DUFF, B.A., Grad. S.P.S ..... *Fellow in Civil Engineering.*
E. J. LASCHINGER, B.A.Sc. ..... *Fellow in Mechanical Engineering.*
A. LANE, Grad. S.P.S. ..... *Fellow in Surveying.*
* ..... *Fellow in Electrical Engineering.*
W. E. BOUSTEAD, Grad. S.P.S., B.A.Sc. *Fellow in Metallurgy and Assaying.*
W. LAWSON, B.A.Sc. ..... *Fellow in Analytical and Applied Chemistry.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

JAMES LOUDON, M.A. ..... *President and Professor of Physics.*
E. J. CHAPMAN, Ph.D., LL.D. ..... *Professor of Mineralogy and Geology.*
R. RAMSAY WRIGHT, M.A., B.Sc. ..... *Professor of Biology.*
W. H. PIKE, M.A., Ph.D. ..... *Professor of Chemistry.*
ALFRED BAKER, M.A. ..... *Professor of Mathematics.*
A. B. MACALLUM, B.A., M.B., Ph.D. ... *Professor of Physiology.*
W. J. LOUDON, B.A. ..... *Demonstrator in Physics.*
C. A. CHANT, B.A. ..... *Lecturer in Physics.*
J. C. McLENNAN, B.A. ..... *Assistant Demonstrator in Physics.*
ALFRED T. DeLURY, B.A. ..... *Lecturer in Mathematics.*
W. L. MILLER, B.A., Ph.D. ..... *Demonstrator in Chemistry.*
J. W. ODELL, B.A. ..... *Fellow in Mathematics.*
G. F. HULL, B.A. ..... *Fellow in Physics.*

For information further than that contained in the Calendar, application may be made to the Secretery, L. B. STEWART.

* To be appointed before October 1st, 1894.

SCHOOL OF PRACTICAL SCIENCE.

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1894-5.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted :—

1. Civil Engineering (including Sanitary Engineering).
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also such a training as will make him immediately useful when he enters into active professional work.

In order to afford an opportunity of taking full advantage of the engineering, chemical and assaying laboratories a fourth or post-graduate year has been established. In the regular three years' course the laboratory and practical work is of such a nature that it can be successfully carried on in the intervals between lectures. All laboratory work which cannot be advantageously pursued in connection with a fixed time table for lectures has been reserved for the fourth year. The fourth year is thus essentially a laboratory year. Lectures are given in connection with the work as occasion requires. Graduates who fulfil the requirements of the fourth year are eligible for the degree of Bachelor of Applied Science (B A.Sc.) University of Toronto. Graduates in the Department of Civil Engineering are also eligible for the degree of Civil Engineer (C.E.), University of Toronto, after three years of practical work.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honour, the Lieutenant-Governor in Council, the 3rd day of April, 1894.

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be Chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma shall be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments :—

   (1) Civil Engineering (including Sanitary Engineering).
   (2) Mining Engineering.
   (3) Mechanical and Electrical Engineering,
   (4) Architecture.
   (5) Analytical and Applied Chemistry.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. Students may enter the Regular Course in any one of the above Departments either (*a*) by presenting certificates of having passed the Matriculation Examination in any University in Her Majesty's Dominions, or in all the subjects of such Matriculation Examina-

tion except Greek and Latin, or the High School Leaving Examination of the Province of Ontario, or (*b*) by presenting certificates of having had at least one year's experience in some recognized engineering, architectural or manufacturing work or business, and passing an examination in the following subjects :—

Arithmetic.—Fundamental rules, metric system, fractions, decimals, powers, square root, mensuration, percentage, interest.

Algebra.—Elementary rules, easy factoring, highest common measure, lowest common multiple, square root, fractions, ratio, simple equations of one, two or three unknown quantities, indices, surds, quadratic equations of one and two unknown quantities.

Euclid.—Books I, II, and III ; deductions.

English.—Dictation, composition.

6. The Council shall have the power of dealing with special cases provided the candidates are sufficiently prepared to take their places in the classes.

7. Special students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper.

8. Certificates of attendance and standing, may be given upon due examination to special students, and such students shall not be required to pass an entrance examination.

9. At the end of the Academic Year, examinations will be held in the different subjects taught. Candidates for Diplomas and Certificates are required to enter for these.

10. All regular students shall be in attendance at the school during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

11. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

ADMISSION.

The conditions of admission for regular and special students are stated in clauses 5, 6, 7 and 8 of the order-in-council, pp. 19 and 20.

For information regarding the conditions for Matriculation in the Universities, application must be made to the Registrars of these Institutions.

Information respecting the High School Leaving Examination may be obtained from the Education Department, Toronto, or from any Principal of a High School or Collegiate Institute.

Students intending to write at the High School Leaving Examination for the purpose of entering the School of Practical Science, may do so without having previously passed the Primary Examination. Their papers must be endorsed "For admission to School of Practical Science."

The only examination held in the School of Practical Science for the purpose of testing qualifications for admission, is that mentioned in clause 5 (*b*) order-in council, p. 20.

This examination will begin at 9 a.m., Wednesday, September 26th, 1894.

Candidates are required to give the Secretary at least two weeks' notice in writing of their intention to take this examination.

FORM OF DIPLOMA.

THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO.

(ESTABLISHED 1878.)

THIS IS TO CERTIFY *that*

.....

of the.....*in the*.....

.....*has completed the Regular Course*

of this School for the Diploma in the.....

extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz.:

.....

.....

.....

WHEREFORE *the said* .....

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

.....*One thousand eight hundred and*.....

and have caused the seal of this School to be hereunto affixed.

.....*Chairman.*

L.S.]

.....*Secretary.*

REGULAR COURSES FOR THE DIPLOMA.

See regulations, pp. 19 and 20.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Sanitary Engineering).
(2) Mining Engineering.
(3) Mechanical and Electrical Engineering.
(4) Architecture.
(5) Analytical and Applied Chemistry.

SESSIONAL FEES, DUES AND DEPOSITS.

These are payable in two instalments, one in each term.

A discount of two dollars will be made on each instalment if paid before the end of the first calendar month of the term in which it is due.

The following table shows the amounts payable in the Regular Courses:—

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	$ c.
I.	Payable in First Term—					
	Sessional Fees	22 00	22 00	22 00	22 00	22 00
	Dues—					
	Physical Laboratory	.....	.....	1 00	.....	1 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	.....	.....	.....	.....	.....
		28 00	28 00	29 00	28 00	29 00
	Payable in Second Term—					
	Sessional Fees	22 00	22 00	22 00	22 00	22 00
	Total	50 00	50 00	51 00	50 00	51 00

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanicol and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	$ c.
II.	Payable in First Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Dues—					
	Physical Laboratory	1 50	1 50	1 50	1 00	1 50
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	2 00	2 00	.....	.....	2 00
		36 50	36 50	34 50	34 00	36 50
	Payable in Second Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Total	63 50	63 50	61 50	61 00	63 50
III.	Payable in First Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Dues—					
	Physical Laboratory	1 00	1 00	3 00	2 00	3 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	.....	.....	.....	.....	3 00
	Mineralogical Laboratory	2 00	2 00			
		38 00	38 00	38 00	37 00	41 00
	Payable in Second Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Total	70 00	70 00	70 00	69 00	73 00

The total expense of a regular three years' course in any department is about $280, which amount includes books, instruments and materials as well as the fees, etc., given in above table.

Fourth or Post-Graduate Year.—The fees, etc., in this year are as follows:—

Payable in First Term—	
Sessional Fees	$30 00
Dues, Library	1 00
Deposits, General	2 00
Payable in Second Term—	
Sessional Fees	29 00
Total	$62 00

Special Students.—The fees payable by special students are stated on p. 55 and following pages. All special students are required to pay the library fee, $1, the general deposit, $2, and the deposits and dues of the laboratories in which they work.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

FELLOWSHIPS.

The following fellowships have been established, open to graduates of the school:—Civil Engineering, Mechanical Engineering, Electrical Engineering, Surveying, Metallurgy and Assaying, Analytical and Applied Chemistry.

Each fellowship is of the value of $500 per annum.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

Candidates are required to send to the Secretary at least three weeks before the commencement of the Annual Examinations in April, and the Supplemental Examinations in October, notice in writing of their intention to take such examinations.

This regulation applies to all regular students and to such special students as may wish to be examined.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respective Years and Departments :—

Subject.	Civil and Mining Engineering.			Mechanical and Electrical Engineering.			Architecture.		
	I. Year.	II. Year.	III. Year.	I. Year.	II. Year.	III. Year.	I. Year.	II. Year.	III. Year.
Applied Mechanics .	*8	6	8	8	12	12	8	5	6
Descript. Geometry.	*7	12	11	7	7	10	7	9	10
Surveying	6	4	4	0	0	0	2	0	0
Architecture	0	0	0	0	0	0	7	9	7

The above number of drawings will include only such as shall be specially prescribed for the purpose.

* These drawings will also be required in the Department of Analytica and Applied Chemistry.

These drawings will be prescribed one by one as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the above-mentioned number of drawings must be made, together with as many others as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum number of drawings shall be 25 and the maximum number 35, except in the Department of Analytical and Applied Chemistry, in which the numbers shall be 18 and 25 respectively.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The drawings must be made on paper 15x22 inches, unless otherwise prescribed.

At the end of each term the drawings must be neatly bound together between covers of approved pattern before they are finally examined, and the student's name, together with his year, term and date, neatly printed on said cover.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the School without permission.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

No field notes will be counted which have not been taken in the field, and during the hours allotted to such work.

The penalties for the infringement of the above two rules will be determined in each case by the Council.

Vacation Work.

Vacation work must be handed in on or before Monday, October 8th, otherwise it will not be counted.

Vacation notes must be on construction only, and consist of not less than 20, nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap, and consist of not less than 20, nor more than 30 pages.

The minimum percentage of marks required for practical work must be made in the case of vacation notes and theses.

No notes, whether taken during the session or the vacation, will be counted unless made in the standard note books of the School.

Theses must be accompanied by carefully made drawings and illustrations separated from the text, and be bound between flat covers.

The sketches for the second year thesis in the Architectural Course are to be made on one side of the sheet of a sketch book and mounted on cardboard or paper 15″ x 22″.

The Architectural students are advised to spend the vacation in an architect's office.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject, he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these latter cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations in subjects taught by the staff of the school will begin on the second day of the session. In other subjects they will be held at the time of the annual examinations.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year or in graduating will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between 9 a.m. and 5 p.m. at the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted, unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

PRIZES.

Through the liberality of Mr. D. B. Dick, Architect, Toronto, a prize of $10 in books will be open annually for competition in the first year of the Architectural Department.

HONORS.

Honors will be granted in each department to students who pass in all the subjects and obtain at least 66 per cent. of the total number of marks allotted to the department at the annual examinations.

Papers read before the Engineering Society will be considered in granting Honors.

The Honor list will be arranged alphabetically.

REGULAR EXAMINATIONS.

(Approximate List.)

I. YEAR.

Examinations held at end of session.

Algebra.
Euclid.
Plane Trigonometry.
Analytical Geometry ...1, 2, 3, 4.
History of Architecture.....4.
Magnetism and Electricity...3, 5.
Acoustics .....4.
Statics.....1, 2, 3, 4.
Dynamics.....1, 2, 3, 4.
Elementary Mechanics..... 5.
Descriptive Geometry.
Surveying .....1, 2, 3, 4.
Chemistry, Elementary.
Electricity .....3, 5.

Examinations held during the session.

Drawings.
Field Notes.....1. 2, 4.
Construction Notes.....1, 2, 3, 4.
Architectural Sketches .....4.
Experimental Physics.....3, 5.
Practical Chemistry.
French and German.....5.

II. YEAR.

Examinations held at end of session.

Calculus.....1, 2, 3, 4.
Astronomy.....1, 2.
Optics
Hydrostatics
Heat.....5.
History of Architecture.....4.
Orders of Architecture.....4.
History of Ornament.....4.
Chemistry, Inorganic.....5.
Chemistry, Applied.
Strength of Materials ...1, 2, 3, 4.
Rigid Dynamics .....1, 2, 3.
Theory of Mechanism .....3.
Descriptive Geometry....1, 2, 3, 4.
Surveying.....1, 2, 4.
Spherical Trigonometry....1, 2, 3
Mineralogy and Geology..1, 2, 4 5.
Electricity.....3, 5.
Metallurgy.

1 Civil Engineering.
2 Mining Engineering.
3 Mechanical and Electrical Engineering.
4 Architecture.
5 Analytical and Applied Chemistry.

Examinations held during the session.

Drawing .....1, 2, 3, 4.
Field Notes ....1, 2.
Construction Notes.....1, 2, 3, 4.
Architectural Sketches.....4.
Experimental Physics.
Electricity, Practical.....3.
Thesis (at beginning of session).
Chemistry, Practical.
Mineralogy, Practical.....1, 2, 5.
French and German.....5.

III. YEAR.

Examinations held at end of session.

Magnetism and Electricity.... 3, 5.
History of Architecture .....4.
History of Ornament.....4.
Principles of Decoration .....4.
Method of Least Squares... 1, 2, 3.
Chemistry, Inorganic and Organic, 5.
Chemistry, Applied.
Mineralogy and Geology..1, 2, 4, 5.
Sanitary Plumbing, Heating and Ventilation.....4.
Theory of Compound Stress,1,2,3,4.
Theory of Construction..1, 2, 3, 4.
Mechanics of Machinery.....3.
Machine Design .....3.
Hydraulics..... .....1, 2, 3, 4.
Thermodynamics.....1, 2, 3.
Descriptive Geometry...1, 2, 3, 4.
Practical Astronomy & Geodesy, 1,2.
Surveying and Levelling...1, 2, 4.
Metallurgy .....2, 3, 5.
Mining and Ore Dressing.....2.

Examinations held during the sesson.

Drawings .....1, 2, 3, 4.
Field Notes .....1, 2.
Construction Notes.....1, 2, 3, 4.
Architectural Sketches.....4.
Experimental Physics.
Electricity, Practical .....3.
Thesis (at beginning of session).
Chemistry, Practical. ..... 5.
Mineralogy, Determinative...1, 2, 5.
Assaying..... .....2, 5.

1 Civil Engineering.
2 Mining Engineering.
3 Mechanical and Electrical Engineering.
4 Architecture.
5. Analytical and Applied Chemistry.

I. DEPARTMENT OF CIVIL ENGINEERING.

(Including Sanitary Engineering.)

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Sanitary Engineers).

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astronomy.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry with special reference to industrial applications.
Practical chemistry.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Hydrographic Surveying.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe practice.
Determination of minerals.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 28, 62 and 63.

III. YEAR.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
Bridges, Roofs, Floors.
Arches, Retaining Walls.
Foundations, etc.
Thermodynamics and Theory of the Steam Engine.
Hydraulics, Sewerage, Water Supply.
Sanitary Plumbing, Heating and Ventilation.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross sections, Field work and Plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a sphere).
Practical Astronomy (treated in the manner required for the O.L.S. and D.L.S. Examinations).

MINERALOGY AND GEOLOGY.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.
Method of Least Squares.

VACATION WORK.

See pages 28, 62 and 63.

II. DEPARTMENT OF MINING ENGINEERING.

This Department is designed to afford the necessary preliminary training to students intending to become Mining Engineers.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane sided solids. Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

II. YEAR.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astronomy.

Drawing.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

Chemistry.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

Engineering and Surveying,

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Mining Surveying.

Mineralogy and Geology.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.

Metallurgy.

Iron and Steel.

Ore-dressing.

Physics.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 28, 62 and 63.

III. YEAR.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
- Shades and Shadows.
- Stone cutting.
- Perspective Projection.

Original Designs—Bridges, Roofs, Floors, Arches, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photograghy.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
- Bridges, Roofs, Floors.
- Arches, Retaining Walls.
- Foundation, etc.

Thermodynamics and Theory of Steam Engine.
Hydraulics.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross-sections, field work and plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.

Trigonometical and Barometrical Levelling.
Geodesy (considering the earth a Sphere).
Practical Astronomy (treated in the manner required for the O.L.S. and D.L.S. Examinations.)

MINERALOGY AND GEOLOGY.

Economic Geology.
Palæontology.
Blowpipe Analysis and Determinative Mineralogy.
Metallurgy of Gold, Silver, Nickel, Copper, etc.
Mining and Ore Dressing continued.
Assaying.

EXPERIMENTAL PHYSICS.

Heat : Specific Heat ; Latent Heat.
Expansion of Air ; Air Thermometer.
Method of Least Squares.

VACATION WORK.

See pages 28, 62 and 63.

III. DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering.
Graphics.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

(Lectures only.) Applications of Trigonometry and Principles of Measurement.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

DRAWING.

Subjects of first year continued.
Coloring and shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

ENGINEERING.

Statics and Dynamics (pure and applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials and Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.
Electricity and Magnetism.
Calculation of Elements of Terrestrial Magnetism.
Declination, Dip, and Horizonal Intensity.
Tangent Galvanometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers.

VACATION WORK.

See pages 28, 62 and 63.

III. YEAR.

DRAWING.

Subjects of previous years continued.

Descriptive Geometry:
Shades and Shadows.
Stone cutting.
Perspective Projection.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

ENGINEERING.

Subjects of previous years continued.
Applied Mechanics:
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.

Electricity :

Dynamos and motors.

Application of principles to practical problems connected with the design, construction and testing of various prime motors and machines.

Experimental work in Engineering Laboratory.

METALLURGY.

Gold, Silver, Nickel, Copper, Lead.

EXPERIMENTAL PHYSICS.

Electric Light Photometry.
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.
Method of Least Squares.

ORIGINAL DESIGNS.

Engine and Machine Design.

VACATION WORK.

See pages 28, 62 and 63.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical and Electrical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

IV. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Plane Analytical Geometry.

DRAWING.

Copying from the flat Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.
Rendering in pencil and pen and ink.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

MECHANICS

Statics (with reference to structures).
Dynamics (preliminary to the study of hydraulics).

SURVEYING.

Principles, Chain Surveying, Mensuration.

PHYSICS.

Acoustics.

HISTORY OF ARCHITECTURE.

General introduction to subject.
Ancient Architecture.
Egyptian, Assyrian and Persian.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching and Water Color, Pen and Ink.
Descriptive Geometry (curved surfaces).

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

MECHANICS.

Statics (pure and applied).
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory.

SURVEYING.

Use of transit and level.
Mensuration.

MINERALOGY AND GEOLOGY.

Elements.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Uses of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.
Acoustics : Laws of vibrating strings.
Determination of Pitch.
Velocity of Sound
Electric Fork.
Chronograph.

HISTORY OF ARCHITECTURE.

Greek and Roman.
Romanesque and Byzantine.

ORDERS AND ELEMENTS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

Ancient.
Classic—Greek. Roman.

VACATION WORK.

See pages 28, 62 and 63.

III. YEAR.

DRAWING.

Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Water Color sketching.
Original Designs—Floors, Trusses, Arches, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

THEORY OF CONSTRUCTION.

Experimental work in Engineering Laboratory.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

MINERALOGY AND GEOLOGY.

Economic Geology.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.
Method of Least Squares.

HISTORY OF ARCHITECTURE.

Gothic and Renaissance, with special reference to England.

History of Ornament.

Early Christian ; Gothic and Renaissance.

Principles of Decoration.

Vacation Work.

See pages 28, 62 and 63.

V. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists or industrial chemists, and also to furnish instruction in chemistry and its useful applications, to students of engineering and architecture, and to special students who may desire such instruction.

I. YEAR.

Mathematics.

Euclid, Algebra, Plane Trigonometry.

Drawing.

Copying from the flat. Lettering.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.
Model Drawing.

Chemistry.

Elementary Chemistry with Laboratory practice.

Mechanics.

Elementary Statics and Dynamics.

Physics.

Magnetism and Electricity.

Experimental Physics.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

MODERN LANGUAGES.

French.
German.

II. YEAR.

CHEMISTRY.

Inorganic and Physical Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Heat.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.
Electricity and Magnetism.
Calculation of Elements of Terrestrial Magnetism.
Declination, Dip and Horizontal Intensity.
Tangent Galvanometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers

MODERN LANGUAGES.

French.
German.

VACATION WORK.

See pages 28, 62, 63 and 64.

III. YEAR.

CHEMISTRY.

Organic Chemistry and Chemical Physics.
Applied Chemistry.
Laboratory work.

MINERALOGY AND GEOLOGY.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

METALLURGY.

Gold, Silver, Nickel, Copper, Lead.

PHYSICS.

Electrical Measurements.
Electric Light Photometry.
Ballistic Galvanometer.
Healing Effects of Currents.
Electrometer.

BIOLOGY.

VACATION WORK.

See pages 28, 62, 63 and 64.

THE FOURTH YEAR.

In order to provide advanced work in the various departments and also to enable students to carry on experimental work in the laboratories with less interruption from attendance at lectures and other causes than is possible in the ordinary three years' course, a sessional course of instruction known as the fourth year has been established.

To be admitted to the fourth year a candidate must be a graduate of the School of Practical Science or an undergraduate of the standing of the fourth year in the University of Toronto in the Honor Department of Chemistry and Mineralogy.

The subjects of study in the fourth year are arranged in the following groups and sub-divisions :—

A. { Astronomy.
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry

D. { Mineralogy and Geology.
Metallurgy and Assaying.

Each student will be required to confine his studies during the session to one of the above groups. He will not be allowed to take less than two nor more than three of the sub-divisions in any group.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all students who select group C.

A student is liable to be called on to assist in any of the experimental and practical work in the group which he has selected, although it may not belong to his special subjects.

Candidates are required to notify the Secretary in writing of their intention to take the fourth year work at least one week before the opening of the session, and to inform him at the same time as to the subjects which they propose to take. These subjects will be submitted to the Council for their approval at the beginning of the session, and no student will be permitted to take any subjects not so approved.

Undergraduates of the University of Toronto of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy may be admitted as students in the fourth year in the groups C and D.

Candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested by their ability to translate extracts from scientific works or periodicals not previously specified.

PASS AND HONORS.

Total marks assigned to fourth year, ... 900.

Sub-divided as follows :—

Work (reckoned in hours) .....540 marks.
Records (notes, drawings, etc.) ....360 "

FOR PASS.

The minimum percentages are :—

Work, 75 per cent.....405 marks.
Records, 50 " .....180 "
And two-thirds of the total marks assigned.....600 "

For Honors.

In deciding the allotment of Honors the whole academic record of the candidate will be taken into consideration, but no honors will be granted unless the candidate shall have received a special recommendation from the member or members of council under whose supervision his fourth year work has been done.

Honors granted will be mentioned in the certificate required under clause 2 of the statute of the University of Toronto respecting the degree of B.A.Sc.

Courses of reading will be indicated in connection with subjects of study.

The above amendments were approved by the Senate of the University of Toronto in so far as they affect the degree of B.A.Sc. on March 9, 1894.

DEGREE OF B.A.Sc.

Candidates who have fulfilled the requirements of the Fourth Year in the School of Practical Science are eligible for the degree of Bachelor of Applied Science in the University of Toronto in accordance with a statute passed by the Senate in 1892, which, with the amendments since made, is as follows :—

By the Senate of the University of Toronto.

Be it enacted :

That the Degree of Bachelor of Applied Science (B.A.Sc.) be hereby established to be granted subject to the following conditions and regulations :—

1. Candidates for the said degree shall hold the diploma of the School of Practical Science in any one of the regular courses of the said School, or shall be of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy in the University of Toronto.

2. They shall have fulfilled the conditions relating to the Fourth or Post-Graduate year in the School of Practical Science, and shall present certificates of having done so to the Registrar of the University. Honors may be granted with such certificates by the Faculty of the School.

3. Each candidate shall prepare a Thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University examiners. This Thesis is to be accompanied by all necessary drawings, specifications, tables and estimates. To pass in the Thesis a candidate must obtain 50 per cent., and to take honors 75 per cent., of the marks assigned.

4. Candidates will be required to select two sub-divisions in any one of the following groups, and to pass such written and oral examinations on the subjects selected as may be prescribed by the University examiners.

A. { Astronomy.
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all candidates who select group C.

To pass in each subject 33 per cent., and to take honors 66 per cent. of the marks assigned will be required.

5. The degree with honors will be conferred on candidates who obtain three out of the four honors possible.

Viz.—Certificate with honors .....(cl. 2.)
Thesis with honors.....(cl. 3.)
Honors in each subject of examination (cl. 4).

6. Candidates are required to send to the Registrar of the University at least three weeks before the commencement of the annual examinations an application for examination according to a printed form to be obtained from the Registrar, and such application must be accompanied by a fee of five dollars.

7. The examination for the degree shall be held in May.

8. The fee for the degree shall be ten dollars and shall be paid to the Registrar not later than the first day of May.

9. The ordinary time for conferring the degree shall be at the University commencement in June. The degree may be conferred at any meeting of the Senate.

10. The thesis, drawings, and other papers accompanying them, shall be the property of the University.

11. In case any change be made in the conditions referred to in the second clause, such change shall be submitted to the Senate and shall have no force so far as the said clause is concerned unless approved by resolution of the Senate.

For further information apply to the Registrar of the University of Toronto.

DOMINION AND ONTARIO LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Ontario Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and Survey of Lands. (Cap. 152, R. S. O.)

"12. (2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of

having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service ; or, in case he has received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

"(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law and, if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

"14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

"Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one years' service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service ; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The attention of the Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

Extracts from the Ontario Architects' Act.

"21. Any student who has matriculated in arts in any university in Her Majesty's dominions, or in the Ontario School of Practical Science, shall not be required to pass the preliminary examinations.

"23. Any person who applies for admission to registration as an architect after the coming into force of this Act, shall be not less than twenty-one years of age, shall have served as a student not less than five years with a principal or principals entitled to register under this Act, or with any other principal or principals approved by the council, and have passed such qualifying examinations as may be required by this Act.

"24.—(3) Any person who has graduated from the Ontario School of Practical Science shall be required to serve only three years as a student, one of which three years may be served during the vacation of such school.

"(4) Upon and after the passing of this Act, students shall serve such term as is required to be served by the provisions of this Act, under indenture, to a registered architect, which indenture and any assignment thereof with affidavit of execution thereto attached shall be filed with the registrar upon payment of such fee as the council may, by regulation, direct."

DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884 :—

By the Senate of the University of Toronto.

Be it enacted :

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C. E. be hereby established, to be granted, subject to the following conditions and regulations :

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employment, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.

5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.

6. Each candidate shall prepare for the approval of the Senate an original essay on some engineering subject accompanied with detailed explanations, drawings, specifications and estimates; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.

7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate not later than the first day of February.

8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C. E., not later than the first day of April.

9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.

10. The examination of the essay, drawings and estimates and any further examination of the candidate that may be considered necessary, may be held in May.

11. The fee for the degree of C. E. shall be $20, and shall be paid to the Registrar not later than the first day of May.

12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.

For further information apply to the Registrar of the University of Toronto.

SYNOPSIS OF THE COURSES OF LECTURES

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT.

With Fees for Special Students.

The same discount for prompt payment will be allowed as in the case of regular students. *See p. 23.*

Special students are advised to enter at the beginning of the session (October 1st), as many subjects begun in the first term are continued through the second, and lectures cannot be repeated.

(Reductions will be made to special students taking several courses.)

☞Text-books for the first year marked (*a*); for second year (*b*); for third year (*c*) and for fourth or post graduate year (*d*).

DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference.—Davidson—Projections.
Angel—Plane and Solid Geometry.
Binn—Orthographic Projection.
Millar—Descriptive Geometry, (*a*), (*b*).
Warren—Stone Cutting (*c*).
MacCord—Lessons in Mechanical Drawing.
Worthen—Topographical Drawing, (*a*), (*b*), (*c*).

Fees for Special Students, $14.

SURVEYING AND LEVELLING.

LAND SURVEYING.

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING.

Longitudinal and Cross Sections.
Plotting.

SETTING OUT.

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION.

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text-Books.—Murray's Manual of Land Surveying (*a*).
Gillespie's Higher Surveying (*b*), (*c*), (*d*).
Henck's or Trautwine's Railway Curves (*b*). (*c*).
Johnson's Theory and Practice of Surveying.

Fees for Special Students, $14.

PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE.

The work included in this course is sufficient to fulfil the requirements of the final examination for Provincial and Dominion land surveyors.

In astronomy the principal subjects are the determination of time, latitude and azimuth, and the general principles of the methods of determining longitudes. Practical instruction is given in the methods of taking observations

In geodesy all surveys, computations and methods of map construction are based upon the supposition that the earth is a sphere.

ADVANCED COURSE (FOURTH YEAR).

The work in this course is intended to fulfil the requirements of the final examinations for Dominion topographical surveyors. It is distinguished from the work of the ordinary course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In geodesy the earth is considered as a spheroid.

Text-Books.—Gillespie's Higher Surveying (*b*), (*c*), (*d*).

Green's Spherical and Practical Astronomy (*c*), (*d*).
Chauvenet's Spherical and Practical Astronomy.
Gore's Elements of Geodesy (*c*), (*d*).
Nautical Almanac, 1895 (*c*), (*d*).

Fee for Special Students, $19.

APPLIED MECHANICS.

STATICS.

The calculation of the stresses in framed structure, solid and riveted beams, arches, etc. Both graphical and analytical methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS.

THEORY OF COMPOUND STRESS.

DESIGNING OF STRUCTURES in timber, iron and masonry—arches, retaining walls, roofs, bridges, etc.

DYNAMICS.

Representation and measurements of forces and motions.
Principals of work and energy.
Efficiency of machines. Friction.
Transmission of energy—belts, shafts, crank and connecting rod, etc.
Fly-wheels, governors.
Balancing of machinery, etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS—

Discharge of water through orifices, notches, etc. Flow in pipes and open channels. Sewerage, Water-works, Water-power, Water-wheels, Turbines, Pumps, etc.

THERMO-DYNAMICS AND THEORY OF THE STEAM ENGINE.

Text-Books and Books of Reference —Von Ott—Graphic Statics (*a*).
Du Bois—Graphic Statics.
" Strains in Framed Structures.
Johnson—Modern Framed Structures.
Merriman—Mechanics of Materials (*b*), (*c*), (*d*).
Rankine—Applied Mechanics.
Lanza—Applied Mechanics (*d*).
Low and Bevis—Machine Drawing and Design (*b*), (*c*).
Unwin—Elements of Machine Design (c).
Shann—Elementary Treatise on Heat (*c*), (*d*).
Peabody—Thermodynamics (*d*).
" Steam Tables (*d*).
Carpenter —- Experimental Engineering (*d*).
Kennedy — Mechanics of Machinery (*b*), (*c*).
Merriman—Hydraulics (*c*), (*d*).
Bodmer—Hydraulic Motors, Turbines, etc. (*d*).
Gerhard — House Drainage and Sanitary Plumbing (*c*).
Santo Crimp — Sewage Disposal Works.

Fees for Special Students, $19.

THEORY OF MECHANISM.

Principles of the transmission of motion without reference to force.

Pitch surfaces, spur wheels, bevel wheels, skew-bevel wheels, trains of wheelwork, teeth of wheels, cams, cranks, eccentrics, links, bands and pulleys, hydraulic connections, frictional gearing, link motion for slide valves, etc., etc.

Text-Books and Books of Reference.—Rankine—Machinery and Millwork.
Halsey—Slide Valve Gears.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (*c*).

Fee for Special Students, $19.

ELECTRICITY.

Instruction will be given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University. The work will comprise :—

ELEMENTARY ELECTRICITY AND MAGNETISM.

MEASURING INSTRUMENTS—

Theory and uses in determining current, electromotive force, resistance, capacity, strength of field, magnetic inductance, etc., etc.

MATHEMATICAL THEORY OF ELECTRICITY.

APPLICATIONS OF ELECTRICITY—

Laboratory work and lectures on telegraph, telephone, dynamos, their design and construction, electric lighting; arc and incandescent systems, storage batteries, transmission of power by electricity, etc.

THEORY OF ALTERNATING CURRENT GENERATORS AND TRANSFORMERS.

Text-Books and Books of Reference.—Kennelly and Wilkinson — Practical Notes for Electric Students (*a*), (*b*).
Stewart & Gee—Practical Physics (*b*).
Kempe—Electrical Testing (*b*).
Cumming—Theory of Electricity (*c*).

Thompson, S. P.—Dynamo Electric Machinery (*c*), (*d*).
Kapp—Electric Transmission of Energy (*d*).
Blakesley—Alternating Currents (*d*)
Bedell and Crehore—Alternate Currents (*d*).
Fleming—Alternate Current Transformers, Vol. I. and II. (*d*).

Current numbers of the "Electrician," the "Electrical World," and "La Lumiere Electrique."

Fee for Special Students, from $19 to $34.

ARCHITECTURE.

History of Architecture—

Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

Orders of Architecture.

History of Ornament.

Principles of Decoration.

Text-Books and Books of Reference.—T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Fergusson—History of Architecture.
Gwilt—Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture (*b*), (*c*).
Leed—Orders of Architecture (*b*).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.

Fee for Special Students, $19.

MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the school.

CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES BY THE PROFESSOR OF CHEMISTRY OF THE UNIVERSITY OF TORONTO.

Inorganic Chemistry.
Organic Chemistry.
Chemical Theory.
Physical Chemistry.

COURSES BY THE PROFESSOR OF APPLIED CHEMISTRY OF THE SCHOOL OF PRACTICAL SCIENCE.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuel, Furnace, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air, Sewage, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis of Food, Water and Air, and Toxicology.
Fee for Special Students, $34 to $54.

MINERALOGY AND GEOLOGY.

MINERALOGY, GEOLOGY, MINING AND METALLURGY.

1. Mineralogy and Geology—
   Mineralogy and Crystallography.
   Geology and Palæontology.
   Lithology.
   Physical Geography.
   Blowpipe Analysis.
   Determinative Mineralogy.

Books of Reference.—Chapman—Mineralogy and Geology of Canada.
Dana—Manual of Geology.
Dana—System of Mineralogy.
Nicholson—Palæontology.
Geikie—Text-Book of Geology.
Plattner—Manual of Blowpipe Analysis.
Chapman or Brush—Mineral Tables.

2. Mining and Metallurgy—

Mining Geology.
Ore Dressing.
Metallurgy of Iron and Steel.
Metallurgy of Nickel, Copper, Silver, etc.
Assaying.

Ihlseng—Manual of Mining.
Kœhler—Bergbaukunde.
Kuhnhardt—Ore Dressing.
Phillip—Ore Deposits.
Balling—Metallhuettenkunde.
Schnabel—Allgemeine Huettenkunde.
Phillip and Bauerman—Elements of Metallurgy.
Mitchell—Assaying by Crookes.
Kerr—Probirkunst.

Fee for Special Students, $19 to $54.

VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a thesis (accompanied by drawings and specifications when necessary) during the subsequent vacation.

The engineering and architectural students will also be required to make, during the vacation, full and clear notes of various constructions that may fall under their notice.

The value of both the thesis and the construction notes will be taken into account in determining standing at the next following examination.

Civil Engineering.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" " *Third* " Sanitary Drainage.

Books of Reference.—Gillmore—Roads, Streets and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Mechanical and Electrical Engineering.

Subject of Thesis for Second Year.—Machine-shop Practice.
" " *Third* " Foundry Practice.

Books of Reference.—Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

Mining Engineering.

Subject of Thesis for Second Year.—Ore-dressing.
" " *Third* " Mining.

Books of Reference.—Kuhnhardt—Ore-dressing in Europe.
Ihlseng.—Manual of Mining.

Architecture.

For the second year the following set of freehand pencil sketches will be required :—

I. Doorway from the object ;
II. Staircase " "
III. Arched bridge (stone) from the object ;
And seven sheets from the object, prints or drawings, with plans and sections where possible.

Subject of the Thesis for the Second Year.—The above sketches.
" " *Third* " Sanitary Drainage.

Books of Reference for Third Year.—Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Subject of Thesis for Second Year.—Sulphuric Acid and Alkali Manufacture.

" " *Third* " Coal Tar Products.

Books of Reference.—Lunge—Manufacture of Sulphuric Acid and Alkali.
Wagner—Chemical Technology.
Thorpe—Dictionary of Applied Chemistry.

Any other works on the above subjects may be consulted and results of original observations should be given.

ENGINEERING LABORATORY.

This Laboratory occupies two floors, having a total area of 10,000 square feet. It consists of three departments, viz. :

(*a*) The department for testing materials of construction.

(*b*) The department for investigating the principles governing the application of power. This department is sub-divided into the steam laboratory, the hydraulic laboratory and electrical laboratory.

(*c*) The department for investigating problems connected with standards of length, time, astronomical observations, etc.

In order to prepare specimens for the testing machines, a shop has been fitted up with a number of high-class machine tools specially suited for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labor. It is also supplied with the necessary appliances for making ordinary repairs.

The machines in the department for testing materials are the following :—

An Emery 50-ton machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A Riehle 100-ton machine for making tests in tension, compression, shearing and cross-breaking. It will take in posts twelve feet long and beams up to eighteen feet in length.

An Olsen torsion machine for testing the strength and elasticity of shafting. This machine will twist shafts up to sixteen feet in length and two inches in diameter.

A Riehle 2,000 pounds cement testing machine. The cement testing room is fitted with all the usual accessories.

The equipment of the power department is as follows :—

A Babcock and Wilcox 52-horsepower boiler.

A Harrison Wharton 12-horsepower boiler.

A 50-horsepower Brown engine. This engine was constructed specially for experimental investigation. It is steam jacketted and has three alternative exhausts, to the open air, to a jet condenser, and to a Wheeler surface condenser, kindly presented to the School by Mr. F. M. Wheeler of New York, the inventor.

There are also a Blake circulating pump, a Knowles air pump and a Blake feed pump, the latter of which was a gift from the manufacturers.

A machine for testing lubricating oils and measuring journal friction, built by Riehle Bros., of Philadelphia.

The hydraulic division of the laboratory is furnished with a three-throw pump with double acting cylinders. It has a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices and weirs, measuring tanks, etc. A three feet jet turbine forms a part of the same equipment.

The electrical division of the laboratory is equipped with the following dynamos :—

Edison, Ball, Thomson-Houston, two Gulcher machines, a Westinghouse alternator with transformers, a Crocker-Wheeler and a Kay motor, also two small fan motors.

There are also a Roberts storage battery, a gravity primary battery and a good equipment of lamps, arc and incandescent, of different types. Also a variety of electrical measuring apparatus, including a Thomson electrical balance.

The power department is equipped with the usual measuring instruments, indicators, gauges, gauge testing apparatus, scales, brakes, dynamometers.

The shafting is driven by a 7-horsepower Otto gas engine, and by the Brown engine above described.

In the geodetic and astronomical department are a 100 feet and a 66 feet standard of length; a 10 foot Rogers comparator with graduating attachment; a Howard astronomical clock and electro-chronograph; a Troughton & Simms 10 inch theodolite and all the ordinary surveying instruments.

THE CHEMICAL LABORATORIES.

The chemical laboratories comprise a laboratory for qualitative analysis with accommodation for 40 students working at one time, a laboratory for quantitative analysis capable of accommodating 20 students and smaller rooms for special work such as water analysis, technical gas analysis, etc. The laboratories are fitted with the usual appliances.

BLOWPIPE AND ASSAYING LABORATORIES.

Six rooms are provided in this department, including a blowpipe laboratory with tables and other appliances for fifteen students ; an assaying laboratory with gas and charcoal furnaces ; a balance room, titration laboratory and store-rooms, with the equipment necessary for wet and dry assays. Lithological microscopes and a lathe with all necessary facilities for the preparation and study of thin rock sections have been provided.

PHYSICAL LABORATORY.

(University of Toronto.)

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of mechanics, sound, light, heat and electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an elementary laboratory, there are several special laboratories, which offer unusual facilities for the conduct of experiments in the various branches of physics.

The electrical apparatus includes electrometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre), Ruhmkorff coils, Crookes' tubes, telephones, etc., etc.

MODERN LANGUAGES.

No special examinations are held in these languages except in the Fourth Year, but it is expected that every student of a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARY, MUSEUMS, ETC.

The Library is supplied with a number of the more important scientific and technical periodicals. A small but valuable collection of works of reference on the subjects of study pursued in the School has been formed and is being added to year by year.

Several thousand specimens have been procured for the Museum, which now contains mineralogical, lithological, metallurgical, and palæontological collections. affording a wide range of material for instruction in the subjects of Mineralogy, Geology and Metallurgy. During the past year the large and valuable exhibit of minerals sent by the Ontario Government to the Columbian Exhibition at Chicago has been presented to the School.

A beginning has also been made in the collection of specimens illustrating Industrial Chemistry and Architecture.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

OFFICERS FOR 1893-4.

President.....J. D. Shields,
Vice-President.....H. Rolph.
Secretary.....J. Armstrong.
Treasurer.....A. T. Tye.
Corresponding Secretary.....W. A. Bucke.
Librarian.....H. F. Barker.
Representatives—Graduates.....E. B. Merrill, Grad S.P.S., B.A.
Fourth Year...H. F. Ballantyne.
Third Year....A. E. Bergey.
Second Year...F. W. Guernsey.
First Year.....H. B. Poliwka.

The Society meets every second Wednesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

ALUMNI ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1894.

President	G. H. Duggan, M. Can. Soc. C.E.
First Vice-President	Jas. McDougall, B. A.
Second Vice-President	R. W. Thomson, B. A. Sc.
Councillors	E. F. Ball, A.M. Can. Soc. C.E.
	J. McAree, B.A.Sc., O.L.S., D.T.S.
	J. Hutcheon, O.L.S.
	G. F. Hanning.
	C. H. Mitchell.
Secretary-Treasurer	Andrew Lane.

Graduates are requested to keep the Secretary acquainted with their addresses.

SESSION 1893-94.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

DEPARTMENT OF CIVIL ENGINEERING.

1st Year.

Carpenter, H. S.
Crews, H. R.
Handy, E. F.
Laing, W. F.
Martin, T.
Proudfoot, H. W.
Stewart. J. A.
Webster, E. B.

2nd Year.

Armstrong, J.
Boswell, E. J.
Dobie, J. S.
Guernsey, F. W.
Gordon, J. P.
Johnson, G.
Meadows, W. W.
Poussett, H. R.
Robinson, F. J.
Sims, H. B.
Tye, A. T.

3rd Year.

Barker, H. F.
Bergey, A. E.
Burton, T.
Chalmers, J.
Fraser, A. T.
Jones, J. E.
Johnson, S. M.
McTaggart, A. L.
Rolph, H.
Shields, J. D.

DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

1st Year.

Allan, A. A.
Blackwood, C. K.
Bell, A.
Campbell, G. McK.
Fowler, C. P.
Gurney, W. C.
Hartman, G.
Haight, H. V.
Harman, O. E.
Jackson, T. C.
Karn, F. H.
King, C. F.
Laurie, R. R.
Macmillan. W. G.
Macbeth, C.
MacMurchy, J. A.
McKechnie, R. S.
Mollins, C. B.
Pease, H. C.
Wickson, F. R.
Wade, H. R.
Watson, J. W.

2nd Year.

Blackwood, A. E.
Brown, L. L.
Brodie, W. M.
Brebner, G.
Connor, A. W.
Elliott, H.
Gray, R. L.
Hull, H. S.
Hudspeth, E.
McGowan, J.
McKinnon, H. L.
McKay, W. N.
Patterson, G. E.
Stocking, F. T.
Moore, I. E.
Plummer, T. H.
Tremaine, R. C. C.
Wood, H. T.
Black, R. G.
Hewett, C. H.

3rd Year.

Angus, R. W.
Boyd, D. G.
Beauregard, A. T.
Bucke, W. A.
Hanly, J. B.
Herald, W. J.
Job, H. E.
Johnston, A. C.
Lash, N. M.
Minty, W.
Nicholson, C. J.
Spotton, A. K.
Wright, R. T.

DEPARTMENT OF MINING ENGINEERING.

1st Year.

Bain, J. W.
DeCew, J. A.

2nd Year.

McPherson, C. W.

DEPARTMENT OF ARCHITECTURE

1st Year.

Forward, E. A.
McMaster, C. G.
Morphy, E. J.

2nd Year.

Campbell, R. J.
Clark, J. T.
Harkness, A.

3rd Year.

Ewart, J. A.

DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

2nd Year.

Smith, V. S.

FOURTH OR POST-GRADUATE YEAR.

Ballantyne, H. F.
Chewett, H. J., C.E.
Goodwin, J. B.
McPherson, A. J
Squire, R. H.
Speller, F. N.
Mitchell, C. H.
McAllister, A. L.
James, D. D.
Keele, J.
Laidlaw, J. T.
Merrill, E. B., B.A.

SPECIAL STUDENTS.

CIVIL ENGINEERING.

Jameson, A. P.
Parker, W. G.
Tate, E. F. R.
Troup, G. E.
Gibson, H. H.

MECHANICAL AND ELECTRICAL ENGINEERING.

Booth, F. E.
Graham, W. A.
Hamilton, R.
Kerr, R.
Lea, E. P.
McCullough, A. W.
Poliwka, H. B.
Rings, H. C.
Roy, A.
Roberts, W. M.
Sifton, E. I.
Stacey, G. E.
Shipe, R. R.
Shipe, E. F.
Wellington, E. S.
Wright, T. D.

MINING ENGINEERING.

Betty, H. K.
Evans, R. B.
Moore, H. H.
Burwash, L. T.

ARCHITECTURE.

Baker, H. C.
McKay, F. G.
Simpson, A. E.
Scott, W. F.

CHEMISTRY.

Taylor, A. P.
McBride, C. A.
J. A. Ardagh, Grad. S.P.S.

ELECTRICITY.

Thomson, R. W., B.A.Sc.
Moore, F. A.

PRIZEMEN.

Engineering.

1879.—	I.	Year	J. McAree	1st prize
1880.—	II.	Year	J. L. Morris	1st prize.
1881.—	I.	Year	G. H. Duggan	1st prize.
	II.	Year	D. Jeffrey	1st prize.
1882.—	I.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize
	II.	Year	G. H. Duggan	1st prize.
	III.	Year	D. Jeffrey	1st prize.
1883.—	I.	Year	B. A. Ludgate	1st prize.
	"	"	A. M. Bowman	2nd prize.
	II.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	III.	Year	G. H. Duggan	1st prize.
1884.—	II.	Year	B. A. Ludgate	1st prize
	III.	Year	E. W. Stern	1st prize.
	"	"	A. R. Raymer	2nd prize.
1885.—	I.	Year	A. F. Lott	1st prize
	"	"	J. Roger	2nd prize.
	II.	Year	T. K. Thomson	1st prize.
	III.	Year	B. A. Ludgate	1st prize.
1886.—	I.	Year	C. H. C. Wright	1st prize.
	"	"	J. E. Ross	2nd prize.
	II.	Year	A. E. Lott	1st prize.
1887.—	I.	Year	H. E. T. Haultain	1st prize.
	II.	Year	C. H. C. Wright	1st prize.
	III.	Year	A. E. Lott	1st prize.
	"	"	J. Roger	2nd prize.
1888.—	I.	Year	E. B. Merrill	1st prize.
	"	"	F. M. Bowman	2nd prize.
	II.	Year	D. D. James	1st prize.
	III.	Year	C. H. C. Wright	1st prize.

1889.—	I.	Year	J. K. Robinson	1st prize.
	"	"	G. E. Silvester	2nd prize.
	II.	Year	E. B. Merrill	1st prize.
	"	"	F. M. Bowman	2nd prize.
	III.	Year	D. D. James	1st prize.
1890.—	I.	Year	C. Fairchild	1st prize.
	II.	Year	J. K. Robinson	1st prize.
	III.	Year	F. M. Bowman	1st prize.
	"	"	E. B. Merrill	2nd prize.
1891.—	I.	Year	A. J. McPherson	1st prize.
	"	"	R. B. Watson	2nd prize.
	II.	Year	J. B. Goodwin	1st prize.
	III.	Year	G. E. Silvester	1st prize.
	"	"	C. W. Dill	2nd prize.
1892.—	I.	Year	A. E. Bergey	1st prize.
	"	"	R. W. Angus	2nd prize.
	II.	Year	A. J. McPherson	1st prize.
	"	"	R. B. Watson	2nd prize.
	III.	Year	E. J. Laschinger	1st prize.
	"	"	C. Fairchild	2nd prize.

ARCHITECTURE.

1891.—	I.	Year	H. Ballantyne.
1892.—	I.	Year	J. A. Ewart.
1893.—	I.	Year	A. Harkness.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

CIVIL ENGINEERING.

1881.—Morris, J. L., C.E., O.L.S.,
Pembroke, Ont.

1882.—Jeffrey, D., Contractor,
Stratford, Ont.

Kennedy, J. H., C.E., O.L.S., Architect, etc.,
Resident Engineer, Sault Line, Shedden, Ont.

McAree, J., B.A.Sc., O.L.S., D.T.S.,
536 Ontario St., Toronto.

1883.—Burns, D. & O.L.S., A. M. Can. Soc. C.E.,
Engineer's Staft, Pennsylvania Co., Pittsburgh, Pa.

Duggan, G. H., M. Can. Soc. E.E.,
Chief Engineer, Dominion Bridge Co., Montreal.

Tyrrell, J. W., C.E., D. & O.L.S.,
Hamilton, Ont.

1884.—Kirkland, W. C.,
Illinois Central Ry., New Orleans, La.

McDougall, J., B.A.,
County Engineer, Court House, Toronto.

Raymer, A. R.,
Engineer's Office, Lake Shore end Michigan Southern R.R.,
Toledo, Ohio.

Robertson, J., O.L.S.,
Coad & Robertson, Civil Engineers, P. L. Surveyors, etc.,
Glencoe, Ont.

Stern, E. W.,
Engineer Scharpe & Kohen Architectural Iron Co., St. Louis,
Mo.

1885.—Bleakley, F. W.,
Seattle, W. T.

Bowman, H. J., D. & O.L.S.,
Town Engineer, Berlin, Ont.

Henderson, E. E., O.L.S.,
Henderson P.O., Piscatiquois, Me.

1885.—Ludgate, B.A., O.L.S.,
Denison, Texas.

McKay, O., O.L.S.,
Windsor, Ont.

1886.—Bowman, A. M., D. & O.L.S.,
Staff U. S. Engineers, Ohio River Improvement, Vanport, Pa.

Hermon, E. B., D. & O.L.S.,
Gordon, Hermon & Burwell, Vancouver, B.C.

Laird, R., O.L.S.,
Assistant to Waterworks Engineer, City Hall, Toronto.

Thomson, T. K., C.E.,
Crane Dept., Yale & Towne, Stamford, Conn.

Tyrrell, H. G., A. M. Can. Soc. C.E.,
Berlin Iron Bridge Co., East Berlin, Conn.

1887.—Burns, J. C. (Deceased).

Lott, A. E.,
Railway Construction, San Antonio de la Huerta, Mexico

McCullough, A. L., O.L.S., A.M. Can. Soc. C.E.,
Resident Sewerage Engineer, West Toronto Junction.

Martin, F., O.L.S., M.B.,
Hospital for Sick Children, Toronto.

Pinhey, C. H., D. & O.L.S.,
630 Wellington St., Ottawa, Ont.

Roger, J., O.L.S.,
Mitchell, Ont.

1888.—Apsey, J. F., O.L.S.,
242 W. Biddle St., Baltimore, Md., U.S.

Ashbridge, W. T.,
City Engineer's Office, Toronto.

Ball, E. F., A.M. Can. Soc. C.E.,
172 Bird Ave., Buffalo, N.Y.

Brown, D.B., O.L.S.,
Mexican Southern Railway, Old Mexico.

Caniff, C.M.,
City Surveyor's Office, Toronto.

Chewett, H. J., C.E., A.M. Can. Soc. C.E.,
School of Practical Science, Toronto (Post-graduate course).

Gibbons, J., D. & O.L.S.,
Alaska Boundary Survey.

1888.—McDowall, R., O.L.S., A.M. Can. Soc. C.E.,
Owen Sound, Ont.
McFarlen, G. W., O.L.S.,
Assistant County Engineer, Court House, Toronto.
Marani, C. J.,
Canada Permanent Loan Co., Vancouver.
Mickle, G. R., B.A.
Mining Engineer, Sudbury, Ont.
Moore, J. H., O.L.S.,
Jmith's Falls, Ont.
Richardson, G. H.,
Engineer Pacific Division, C.P.R.
Rose, K.,
Mexican Southern Railway, Tonilla, Est-de-Jalisco, Mexico.
Ross, J. E., O.L.S.,
Riverside, Cal.
Wright, C. H. C., B.A. Sc.,
Lecturer in Architecture, S.P.S., Toronto.

1889.—Carey, B.,
Engineer's Office, Toronto, 30 Russell St.
Chalmers, W. J.
Cayuga, Ont.
Clement, W. A.,
City Engineer's Office, Toronto.
Hanning, G. F.,
City Engineer's Office, Toronto.
Haultain, H. E. T.,
Bucke, Haultain & Richardson, Consulting Mining and Electrical Engineers, Kaslo, Kootenay, B.C.
Irvine, J.,
Harriston, Ont.
James, D. D., O.L.S.,
School of Practical Science, Toronto (Post-graduate course).
Mill, F. X.,
City Engineer's Office, Brockville.
Moberly, H. K.,
Frostburg, Va., U.S.A.
Rosebrugh, T. R., M.A.,
Lecturer in Electrical Engineering, S.P.S., Toronto.
Wickett, T.,
University Medical College, Toronto.

1890.—Bowman, F. M., O.L.S., C.E.,
Chief Draftsman, Riter & Conley, Alleghany, Pa.
Bucke, M. A.,
Bucke, Haultain & Richardson, Consulting, Mining and Electrical Engineers, Kaslo, Kootenay, B.C.
Corrigan, C. D.,
Box 292, Vancouver, B.C.
Duff, J. A., B.A.,
Fellow in Engineering, S.P.S., Toronto.
English, A. B.,
106 Gould St., Toronto.
Garland, N. L.,
Eglington, Ont.
Hutcheon, J., O.L.S.,
Guelph, Ont.
Innes, W. L., O.L.S., C.E.,
Ranney & Innes, Civil Engineers and Surveyors, Peterboro', Ont.
Merrill, E. B., B.A.,
Toronto Technical School, School of Practical Science (Post-graduate course).
Pedder, J. R., O.L.S.,
J. Galt, C.E., Toronto.
Wiggins, T. H., O.L.S.,
Saunders & Wiggins, Civil Engineers and Surveyors, Brockville, Ont.
Withrow, W. J.,
Fetherstonhaugh & Co., Toronto.

1891.—Beatty, H. J., O.L.S.,
Engineer's Staff, Atlantic & N. W. Division C.P.R., Pembroke, Ont.
Deacon, T. R., O.L.S.,
Rat Portage, Ont.
Dill, C. W.,
Staff of Willis Chipman, C.E., 21 Wood St., Toronto.
Lane, A.,
Fellow in Surveying, S.P.S., Toronto.
McAllister, J. E.,
Dominion Bridge Co., Montreal, P.Q.
Moore, J. E. A.,
Islington, Ont.
Newman, W., O.L.S.,
Maycock & Newman, Windsor, Ont.

1891.—Robinson, J. K., Deceased.
Russel, W.,
Engineer's Staff O. A. & P. S. R'y, Pembroke, Ont.
Silvester, G. E., O.L.S.,
Ringwood, Ont.
Symmes, H. D.,
Engineer Street Ry., St. Catharines, Ont.

1892.—Allan, J. R.,
Renfrew, Ont.
Alison, T. H., B.A. Sc.,
52 Murray St., Toronto.
Anderson, A. G.,
Boston Bridge Co., 61 Hancock St., Boston, Mass.
Fairchild, C.,
City Engineer's Office, Brantford, Ont.
Goodwin, J. B.,
School of Practical Science, Toronto (Post-graduate course).
Laschinger, E. J., B.A. Sc.,
Fellow in Mechanical Engineering, School of Practical Science, Toronto.
Laing, A. T., B.A. Sc.,
Engineer's Staff, L. S. & M. S. Ry., Toledo, O.
McEntee, B., B.A. Sc.,
28 Queen St. E., Toronto.
Mitchell, C. H.,
School of Practical Science (Post-graduate course).
Playfair, N. L.,
Hall Signal Co., Baltimore, Md.
Prentice, J. M., Deceased.
Ross, J. A.,
Engineer's Staff, L. S. & M. S. Ry., Toledo, O
Smith, A.,
Napanee, Ont.
Thomson, R. W., B.A. Sc.,
Toronto Technical School.

1893.—Ardagh, J. A.,
School of Practical Science, Toronto. (Special Student.)
Brown, G. L.,
Morrisburg, Ont.
Charlesworth, L. C.,
Bedford Park, Ont.

Dunn, T. H.,
Arkona, Ont.
Fairbairn, J. M. R.,
Engineer Branch, Militia Department, Ottawa, Ont.
Forester, C.,
Gormley, Ont.
Francis, W. J.,
Grand Trunk Railway, Toronto.
Laidlaw, J. T.,
School of Practical Science, Toronto (Post-graduate course).
McFarlen, T. J.,
10 St. Vincent St., Toronto, Ont.
McPherson, A. J.,
School of Practical Science, Toronto (Post-graduate course).
McAllister, A. L.,
School of Practical Science, Toronto (Post-graduate course).
Macallum, A. F.,
257 Wellesley St., Toronto, Ont.
Main, W. T.
Brampton, Ont.
Marani, V. G.,
Staff of City Engineer, Cleveland, O.
Mines, W.,
Mount Brydges, Ont.
Russel, R.,
Engineer's Staff, O. A. & P. S. Ry., Pembroke, Ont.
Speller, F. N.,
School of Practical Science, Toronto (Post-graduate course).
Squire, R. H.,
School of Practical Science, Toronto (Post-graduate course).
Taylor, W. V.,
Rathbun Co., Gananoque, Ont.
Watson, R. B.,
Draftsman, Pittsburg Bridge Co., Pittsburg, Pa.

MECHANICAL AND ELECTRICAL ENGINEERING.

1890.—Ross, R. A.,
Royal Electrical Co., Montreal, P.Q.

1891.—Merrill, E. B., B.A.,
Toronto Technical School, School of Practical Science (Post-graduate course).

1892.—Lea, W. A., B.A. Sc.
5 Bedford Road, Toronto.
Milne, C. G., B.A. Sc.,
Brown's Corners, Ont.
White, A. V.,
Edison General Electric Co., Peterboro, Ont.
1893.—Goldie, A. R.,
Goldie & McCullough, Galt, Ont.
Hanly, S. C.,
Waubashene, Ont.
Lash, F. L.,
18 Grenville St., Toronto.
Robertson, J. M.,
Sibley College, Cornell University, Ithica.

ARCHITECTURE.

1892.—Langley, C. E,,
Langley & Langley, Architects, Toronto.

1893.—Ballantyne, H. F.,
School of Practical Science, Toronto (Post-graduate course).
Fingland, W.,
Ellis & Fingland, Architects Equitable Bdg., Baltimore.
Keele, J.,
School of Practical Science, Toronto (Post-graduate course).

ANALYTICAL AND APPLIED CHEMISTRY.

1890.—Boustead, W. E., B.A. Sc.,
Fellow in Metallurgy and Assaying, S.P.S., Toronto.

1891.—James, O. S., B.A. Sc.
102 Howard St., Toronto, Ont.

1892.—Lawson, W., B A. Sc.,
Fellow in Chemistry, School of Practical Science, Toronto.

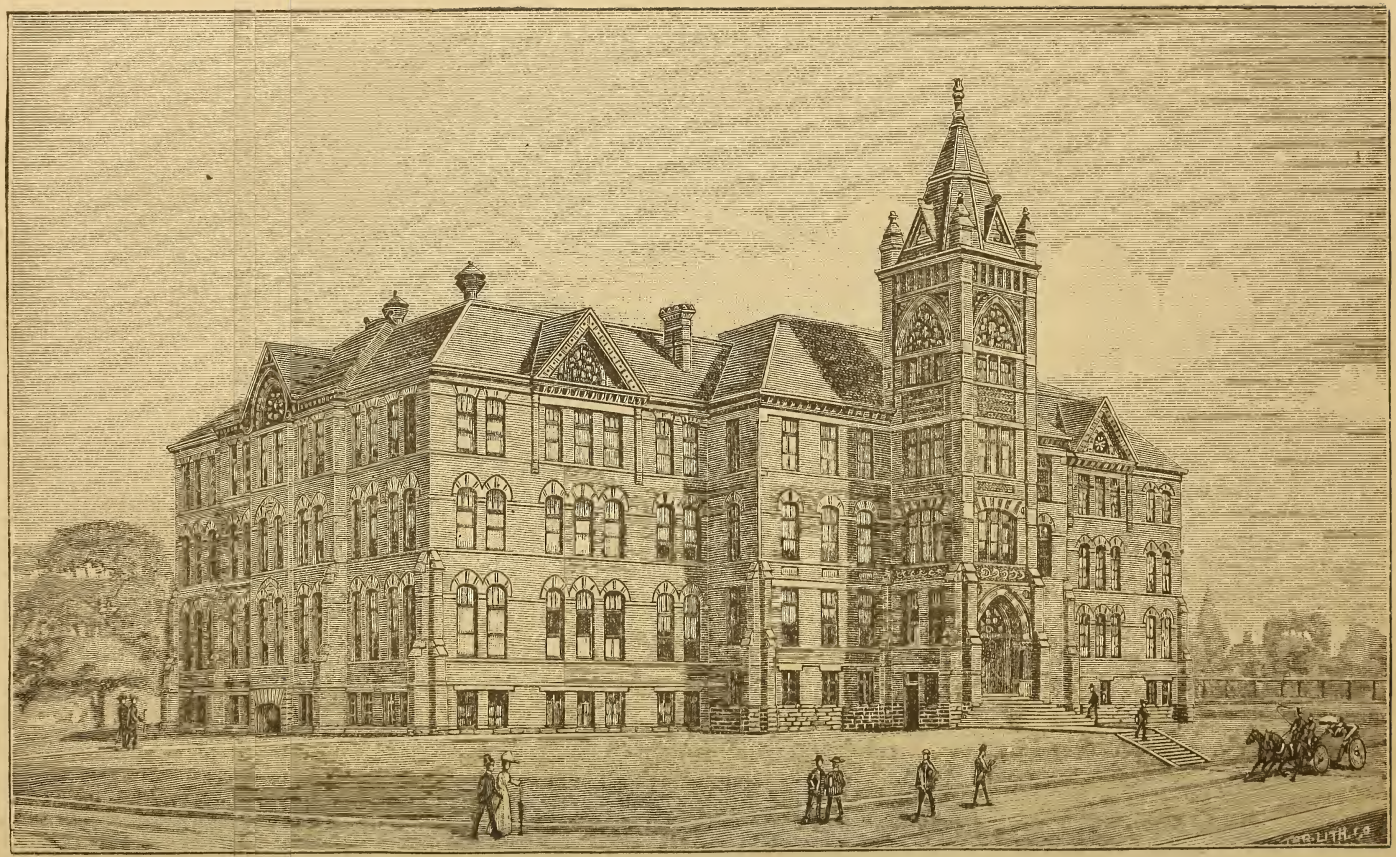
UNIVERSITY OF TORONTO.

Degree of C. E.

Date of Admission.	
1885	J. L. Morris.
1886	J. H. Kennedy.
1889	J. W. Tyrrell.
1892	T. K. Thomson.
1892	H. J. Chewett.
1893	W. L. Innes.
1893	F. M. Bowman.

Degree of B.A.Sc.

Date of Admission.	
1893	Alison, T. H.
1893	James, O. S.
1893	Laing, A. T.
1893	Laschinger, E. J.
1893	Lawson, W.
1893	Lea, W. A.
1893	McAree, J.
1893	McEntee, B.
1893	Milne, C. G.
1893	Thomson, R. W.
1893	Wright, C. H. C.



SCHOOL OF PRACTICAL SCIENCE, TORONTO.

CALENDAR

OF THE

School of Practical Science,

PROVINCE OF ONTARIO,

WITH A

SYLLABUS

OF THE

Courses of Instruction and the Regulations for Diplomas.

18th SESSION **1895-1896.**

TORONTO:
PRINTED BY WARWICK BROS. & RUTTER, 68 AND 70 FRONT STREET, WEST.
1895.

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1895

SEPTEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	..	..	..	..	..
..	..	..	..	..	..	..

20. Meeting of Council.
25. **Entrance Examinations** begin.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	**16**	17	18	19
20	21	22	23	24	25	26
26	28	29	**30**	31	..	.
..	..	..	..	..	..	..

1. **FIRST TERM** begins.
2. Supplemental Examinations begin.
11. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
.	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	**13**	14	15	16
17	18	19	20	21	22	23
24	25	29	**27**	28	29	30
..	..	..	..	..	..	..

8. Meeting of Council.

1896

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	**11**	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..
..	..	..	..	..	..	..

13. Meeting of Council.
23. **FIRST TERM** ends.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	**15**	16	17	18
19	20	21	22	23	24	25
26	27	28	**29**	30	31	..
..	..	..	..	..	..	..

8. **SECOND TERM** begins.
10. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	**12**	13	14	15
16	17	18	19	20	21	22
23	24	25	**26**	27	28	29
.	..	..	..	..	..	..

14. Meeting of Council.
19. Ash Wednesday. Building closed.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	**11**	12	13	14
15	16	17	**18**	19	20	21
22	23	24	25	26	**27**	28
29	30	31	..	..	..	..
..	..	..	..	..	..	..

13. Meeting of Council.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..
..	..	..	..	..	..	..

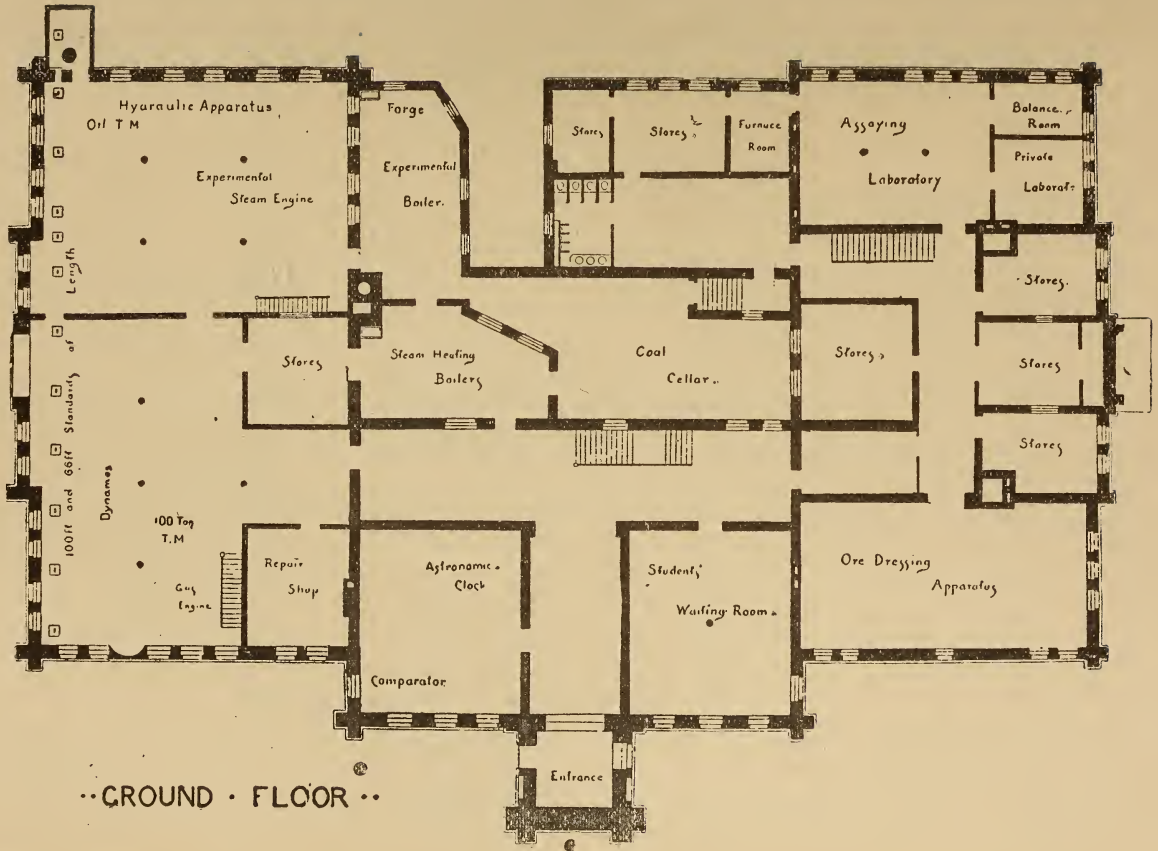
10. Lectures and Practical Work close.
10. Meeting of Council.
3. Good Friday. Bdg. closed.
17. **Examinations begin.**

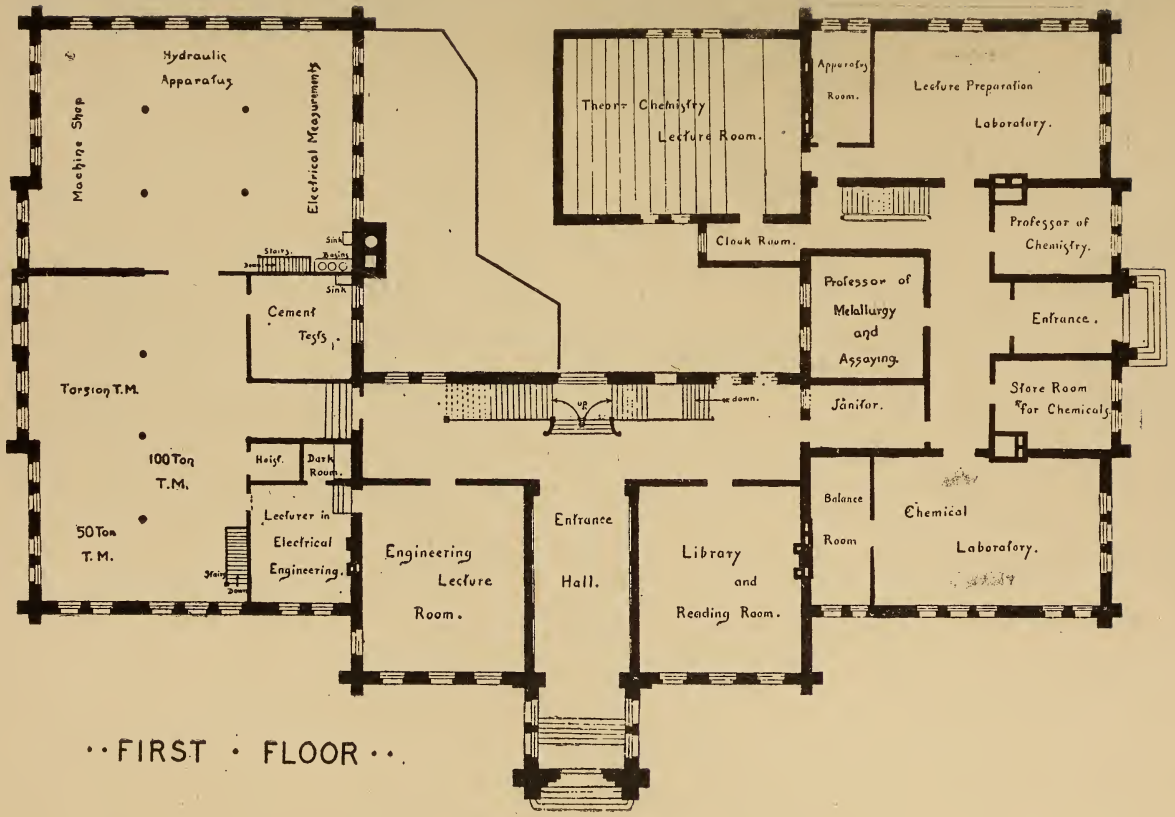
MAY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	..	..	..	..	..	..

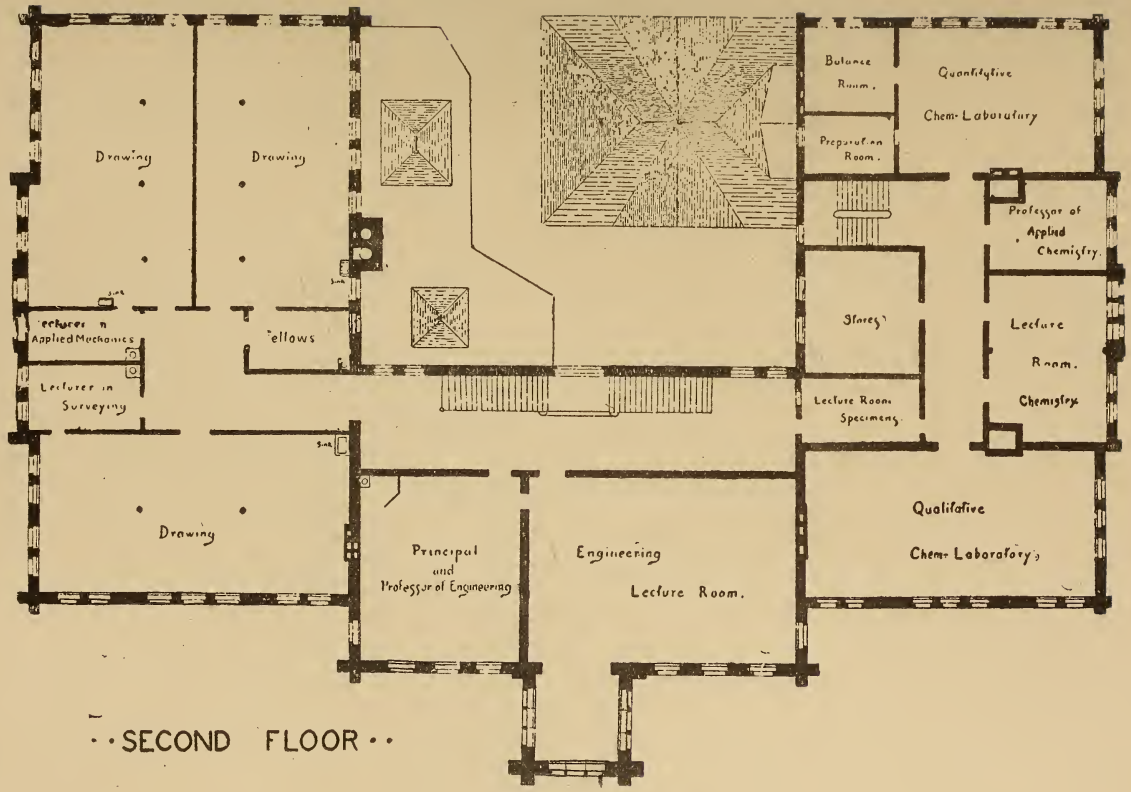
1. **SECOND TERM** ends.

Black figures denote meetings of Engineering Society.


Hyraulic Apparatus
Oil T M
Experimental
Steam Engine
Forge
Experimental
Boiler.
Stores
Stores
Furnace
Room
Assaying
Laboratory
Balance
Room
Private
Laboratory
Stores
Stores
Stores
Stores
Steam Heating
Boilers
Coal
Cellar
Stores
Dynamos
100 Ton
T.M
Gas
Engine
Repair
Shop
Astronomical
Clock
Students'
Waiting Room
Ore Dressing
Apparatus
Comparator
Entrance
100ft and 66ft Standards of Length
GROUND · FLOOR


Hydraulic Apparatus
Machine Shop
Electrical Measurements
Stairs
Sink
Basins
Sink
Cement Tests
Torsion T.M.
100 Ton T.M.
50 Ton T.M.
Hoist.
Dark Room.
Lecturer in Electrical Engineering.
Stairs
Engineering Lecture Room.
Entrance Hall.
Library and Reading Room.
Theoretical Chemistry Lecture Room.
Apparatus Room.
Lecture Preparation Laboratory.
Cloak Room.
Professor of Metallurgy and Assaying.
Janitor.
Professor of Chemistry.
Entrance.
Store Room for Chemicals
Balance Room
Chemical Laboratory.
up
down.

FIRST FLOOR



SECOND FLOOR

Dais.
Assembly
Hall.
Museum.
Toxicological
Laboratory
Laboratory for
Sanitary
Chemistry.
Lecture
Room
Mineralogy
and
Geology
Museum.
Architectural
Lecture Room.
Drawing.
Lecturer
in
Architecture.

THIRD FLOOR

TIME TABLE—FIRST YEAR—SESSION 1895-96.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	
9-10	* Analytical Geometry, 1, 2, 3, 4 Chemical Lab'y, 5	* Euclid.	* Trigonometry.	* Algebra.	* Trigonometry.	9-10
10-11	* Elect'y & Magn'm, 3, 5 (*a*) Drawing, 1, 2, 4 do 3, 5 (*b*)	Statics, 1, 2, 3, 4 do 5 (*a*) Drawing, 5 (*b*)	* Acoustics, 4 (*a*) Electricity, 3, 5 (*b*) Drawing, 1, 2 do 3, 5 (*a*) do 4 (*b*)	Statics, 1, 2, 3, 4 do 5 (*a*) Drawing, 5 (*b*)	* Elect'y & Magn'm, 3, 5 (*a*) Electricity, 3, 5 (*b*) History of Arch'e, 4 Drawing, 1, 2	10-11
11-12	Drawing, 1, 2, 3, 4 Chemical Lab'y, 5	* Chemistry.	* Chemistry.	* Chemistry.	Pen and Ink, 4 Drawing, 1, 2, 3, 5	11-12
12-1	Drawing, 1, 2, 3, 4 Chemical Lab'y, 5	Dynamics.	Descriptive Geometry.	Surveying, 1, 2, 3, 4 Drawing, 5	Drawing.	12-1
1-2						1-2
2-3	Chemical Lab'y.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	2-3
3-4	Chemical Lab'y, 3, 5 Drawing, 1, 2, 4	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	3-4
4-5	Chemical Lab'y, 3, 5 Drawing, 1, 2 History of Arch'e, 4	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4, (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—SECOND YEAR—SESSION 1895-96.

	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	
9-10	Rigid Dynamics, 1, 2, 3 History of Arch'e, 4	Surveying (Lect.) 1, 2, 4 Electricity, 3	* Calculus, 1, 2, 3, 4	* Astronomy, 1 Lithology, 2 Electricity, 3 Drawing, 4	* Calculus, 1, 2, 3, 4	9-10
10-11	* Optics, (*b*) Spherical Trig'y, 1, 2, 3 (*a*) Drawing, 4 (*a*)	* Hydrostatics, (*b*) * Heat, 5 (*b*) Metallurgy, (*a*)	Descriptive Geo. 1,2,3,4	* Hydrostatics, (*b*) * Heat, 5 (*b*) Metallurgy, (*a*)	* Optics, (*b*) Spherical Trig'y, 1, 2, 3 (*a*) Drawing, 4 (*a*)	10-11
11-12	* Inorganic Chem'y, 5 Strength of Materials, 1, 2, 3, 4	Chemical Lab'y. Drawing.	Mineralogy and Geology, 1, 2, 4, 5 Theory of Mech'ism, 3	Drawing, 1, 2, 4 Electrical Lab'y, 3	* Inorganic Chem'y, 5 Pen and Ink, 4 Drawing, 1, 2, 3	11-12
12-1	Mineralogy and Geology, 1, 2, 4, 5 Theory of Mech'ism, 3	Chemical Lab'y. Drawing.	Strength of Materials, 1, 2, 3, 4	Drawing, 1, 2, 4 Electrical Lab'y, 3	Drawing, 1, 2, 3, 4	12-1
1-2						1-2
2-3	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing, 4	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Orders of Arch'e, 4 Drawing, 1, 2 do 3 (*b*)	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, (*b*) Field Work, 1, 2, 4 (*a*) Drawing, (*b*)	2-3
3-4	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, (*b*) Field Work, 1, 2, 4 (*a*) Drawing, (*b*)	3-4
4-5	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, (*b*) Field Work, 1, 2, 4 (*a*) Drawing, (*b*) History of Ornament, 4	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allottedare to be spent in the laboratories.

TIME TABLE—THIRD YEAR—SESSION 1895-96.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	
9-10	* Biology, 5 Thermodynamics, 1, 2, 3 Drawing, 4	Hydraulics, 1, 2, 3, 4	* Biology, 5 Thermodynamics, 1, 2, 3 History of Arch'e, 4	Hydraulics, 1, 2, 3, 4	* Biology, 5 Compound Stress, 1, 3, 4 Mining and Ore Dressing, 2	9-10
10-11	Drawing, 1, 2, 3, 4	Astronomy and Geodesy, 1 Machine Design, 3 Drawing, 4 Ore Deposits, 2 (*a*) Chemical Lab'y, 2 (*b*)	Mineralogical Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Drawing, 3, 4 do 1 (*b*)	Astronomy and Geodesy, 1 Machine Design, 3 Drawing, 4 Ore Deposits, 2 (*a*) Chemical Lab'y, 2 (*b*)	Drawing, 1, 2, 3, 4	10-11
11-12	Drawing, 1, 2, 3 History of Arch'e, 4	Constructive Design, 1, 4 do 2, 3 (*a*) Drawing, 3 (*b*) Chemical Lab'y, 2 (*b*)	Mineralogical Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Drawing, 3, 4 do 1 (*b*)	Constructive Design, 1, 4 do 2, 3 (*a*) Drawing, 3 (*b*) Chemical Lab'y, 2 (*b*)	Drawing, 1, 2, 3, 4 Mechanics of Machinery, 3	11-12
12-1	Applied Chemistry.	Mineralogy and Geology, 1, 2, 4, 5 Drawing, 3	Mineral'l Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Principles of Dec'n, 4 Drawing, 3 do 1 (*b*)	Mineralogy and Geology, 1, 2, 4, 5 Electricity, 3	Applied Chemistry.	12-1
1-2						1-2
2-3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*) Plumbing, Heating, and Ventilation, 4	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	Descriptive Geometry, 1, 2, 3, 4 (*a*) Theory of Least Squares, 1, 3 (*b*) Chemistry, 2 (*b*)	* Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 4 (*b*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 2 (*b*) Drawing, 3 (*b*)	2-3
3-4	* Physical Lab'y, 3, 5 (*a*) * Organic Chemistry, 5 Drawing, 1, 2, 4 do 3 (*b*)	* Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 3 do 4 (*a*) Chemistry, 2 Pen and Ink, 4 (*b*)	* Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 4, (*b*) Chemical Lab'y, 2 (*b*) * Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	3-4
4-5	* Physical Lab'y, 3, 5 (*a*) Surveying (Lect.) 1, 2, 4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 3, 4 Chemistry, 2	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 4 (*b*) Chemical Lab'y, 2 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—FOURTH OR POST-GRADUATE YEAR.

There is no regular time table for the work of this year. The time of the students is spent almost wholly in the engineering, chemical, and assaying laboratories. The hours are from 9 a.m. to 5 p.m. every working day during the session. Lectures are given at such intervals as may suit the laboratory work.

FACULTY OF THE SCHOOL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., *Professor of Engineering (Chairman).*
W. HODGSON ELLIS, M.A., M.B. ..... *Professor of Applied Chemistry.*
A. P. COLEMAN, M.A., Ph.D ..... *Professor of Assaying and Metallurgy*
L. B. STEWART, P.L.S., D.T.S ..... *Lecturer in Surveying (Secretary).*
C. H. C. WRIGHT, B.A.Sc ..... *Lecturer in Architecture.*
T. R. ROSEBRUGH, M.A., Grad. S.P.S.. *Lecturer in Electrical Engineering.*
J. A. DUFF, B.A., Grad. S.P.S. ..... *Lecturer in Applied Mechanics.*
G. R. MICKLE, B.A., Grad. S.P.S..... *Lecturer in Mining.*

ASSISTANT INSTRUCTORS.

J. KEELE, B.A.Sc ..... *Fellow in Civil Engineering.*
E. J. LASCHINGER, B.A.Sc..... *Fellow in Mechanical Engineering.*
A. T. LAING, B.A.Sc..... *Fellow in Surveying.*
R. W. ANGUS, Grad. S.P.S..... *Fellow in Electrical Engineering.*
W. E. BOUSTEAD, B.A.Sc..... *Fellow in Metallurgy and Assaying.*
W. LAWSON, B.A.Sc..... *Fellow in Analytical and Applied Chemistry.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

JAMES LOUDON, M.A..... *President and Professor of Physics.*
E. J. CHAPMAN, Ph.D., LL.D. ..... *Professor of Mineralogy and Geology.*
R. RAMSAY WRIGHT, M.A., B.Sc..... *Professor of Biology.*
W. H. PIKE, M.A., Ph.D. ..... *Professor of Chemistry.*
ALFRED BAKER, M.A. ..... *Professor of Mathematics.*
A. B. MACALLUM, B.A., M.B., Ph.D.. *Professor of Physiology.*
W. J. LOUDON, B.A ..... *Demonstrator in Physics.*
C. A. CHANT, B.A ..... *Lecturer in Physics.*
J. C. McLENNAN, B.A..... *Assistant Demonstrator in Physics.*
ALFRED T. DeLURY, B.A ..... *Lecturer in Mathematics.*
W. L. MILLER, B.A., Ph.D ..... *Demonstrator in Chemistry.*
J. W. ODELL, B.A ..... *Fellow in Mathematics.*
G. F. HULL, B.A..... *Fellow in Physics.*

For information further than that contained in the Calendar, application may be made to the Secretary, L. B. STEWART.

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1895-6.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction in each of which Diplomas are granted, viz. :—

1. Civil Engineering (including Sanitary Engineering).
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also such a training as may make him immediately useful when he enters into active professional work.

In order to afford an opportunity of taking full advantage of the engineering, chemical and assaying laboratories a fourth or post-graduate year has been established. In the regular three years' course the laboratory and practical work is of such a nature that it can be successfully carried on in the intervals between lectures. All laboratory work which cannot be advantageously pursued in connection with a fixed time table for lectures has been reserved for the fourth year. The fourth year is thus essentially a laboratory year. Lectures are given in connection with the work as occasion requires. Graduates who fulfil the requirements of the fourth year are eligible for the degree of Bachelor of Applied Science (B.A.Sc.) University of Toronto. Graduates in the Department of Civil Engineering are also eligible for the degree of Civil Engineer (C.E.), University of Toronto, after three years of practical work.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by his Honour, the Lieutenant-Governor in Council, the 3rd day of April, 1894.

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma shall be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments:

   (1) Civil Engineering (including Sanitary Engineering).
   (2) Mining Engineering.
   (3) Mechanical and Electrical Engineering.
   (4) Architecture.
   (5) Analytical and Applied Chemistry.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. Students may enter the Regular Course in any one of the above Departments either (*a*) by presenting certificates of having passed the Matriculation Examination in any University in Her Majesty's Dominions, or in all the subjects of such Matriculation Examina-

tion except Greek and Latin, or the High School Leaving Examination of the Province of Ontario, or (*b*) by presenting certificates of having had at least one year's experience in some recognized engineering, architectural or manufacturing work or business, and passing an examination in the following subjects :

Arithmetic.—Fundamental rules, metric system, fractions, decimals, powers, square root, mensuration, percentage, interest.

Algebra.—Elementary rules, easy factoring, highest common measure, lowest common multiple, square root, fractions, ratio, simple equations of one, two or three unknown quantities, indices, surds, quadratic equations of one or two unknown quantities.

Euclid.—Books I, II, and III ; deductions.

English.—Dictation, composition.

6. The Council shall have the power of dealing with special cases, provided the candidates are sufficiently prepared to take their places in the classes.

7. Special students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper.

8. Certificates of attendance and standing, may be given upon due examination to special students, and such students shall not be required to pass an entrance examination.

9. At the end of the Academic Year, examinations will be held in the different subjects taught. Candidates for Diplomas and Certificates are required to enter for these.

10. All regular students shall be in attendance at the school during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

11. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

ADMISSION.

The conditions of admission for regular and special students are stated in clauses 5, 6, 7 and 8 of the order in council, pp. 19 and 20.

For information regarding the conditions for Matriculation in the Universities, application must be made to the Registrars of these Institutions.

Information respecting the High School Leaving Examination may be obtained from the Education Department, Toronto, or from any Principal of a High School or Collegiate Institute.

Students intending to write at the High School Leaving Examination for the purpose of entering the School of Practical Science, may do so without having previously passed the Primary Examination. Their papers must be endorsed "For admission to School of Practical Science."

The only examination held in the School of Practical Science for the purpose of testing qualifications for admission, is that mentioned in clause 5 (*b*) order in council, p. 20.

This examination will begin at 9 a.m., Wednesday, September 25th, 1895.

Candidates are required to give the Secretary at least two weeks' notice in writing of their intention to take this examination.

FORM OF DIPLOMA.

THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO.

(Established 1878.)

THIS IS TO CERTIFY *that*

....

of the .... *in the* ....

.... *has completed the Regular Course of this School for the Diploma in the* .... *extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz.:*

....

....

....

Wherefore *the said* .... *becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.*

In Witness *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this* .... *day of* .... *One thousand eight hundred and* .... *and have caused the seal of this School to be hereunto affixed.*

.... *Chairman.*

[L.S.]

.... *Secretary.*

REGULAR COURSES FOR THE DIPLOMA.

See regulations, pp. 19 and 20.
The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Sanitary Engineering).
(2) Mining Engineering.
(3) Mechanical and Electrical Engineering.
(4) Architecture.
(5) Analytical and Applied Chemistry.

SESSIONAL FEES, DUES AND DEPOSITS.

These are payable in two instalments, one in each term.

A discount of two dollars will be made on each instalment if paid before the end of the first calendar month of the term in which it is due.

The following table shows the amounts payable in the Regular Courses:

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	$ c.
I.	Payable in First Term—					
	Sessional Fees	22 00	22 00	22 00	22 00	22 00
	Dues—					
	Physical Laboratory	.....	.....	1 00	.....	1 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory ...	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	.... ..	.....	.....	.....	.....
		28 00	28 00	29 00	28 00	29 00
	Payable in Second Term—					
	Sessional Fees.....	22 00	22 00	22 00	22 00	22 00
	Total	50 00	50 00	51 00	50 00	51 00

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	$ c.
II.	Payable in First Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Dues—					
	Physical Laboratory	1 50	1 50	1 50	1 00	1 50
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	2 00	2 00	.....	.....	2 00
		36 50	36 50	34 50	34 00	36 50
	Payable in Second Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Total	63 50	63 50	61 50	61 00	63 50
III.	Payable in First Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Dues—					
	Physical Laboratory	1 00	.....	3 00	2 00	3 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	.....	.....	.....	.....	3 00
	Mineralogical Laboratory	2 00	2 00	.....	.....	.....
		38 00	37 00	38 00	37 00	41 00
	Payable in Second Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Total	70 00	69 00	70 00	69 00	73 00

The total expense of a regular three years' course in any department is about $280, which amount includes books, instruments and materials as well as the fees, etc., given in above table.

Fourth or Post-Graduate Year.—The fees, etc., in this year are as follows:

Payable in First Term—	
Sessional Fees	$30 00
Dues, Library	1 00
Deposits, General	2 00
Payable in Second Term—	
Sessional Fees	29 00
Total	$62 00

Special Students.—The fees payable by special students are stated on p. 50 and following pages. All special students are required to pay the library fee, $1, the general deposit, $2, and the deposits and dues of the laboratories in which they work.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

Special Certificates.—Certificates will be granted to special students only in cases in which application has been made to the Council at the beginning of the session and conditions of award arranged.

FELLOWSHIPS.

The following fellowships have been established, open to graduates of the school: Civil Engineering, Mechanical Engineering, Electrical Engineering, Surveying, Metallurgy and Assaying, Analytical and Applied Chemistry.

Each fellowship is of the value of $500 per annum.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

REGULATIONS RESPECTING EXAMINATIONS APPROVED BY THE COUNCIL OF THE SCHOOL.

Candidates are required to send to the Secretary at least three weeks before the commencement of the Annual Examinations in April, and the Supplemental Examinations in October, notice in writing of their intention to take such examinations.

This regulation applies to all regular students and to such special students as may be candidates for certificates.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respective Years and Departments :

Department.	Year.	Applied Mechanics.	Descriptive Geometry.	Surveying.	Architecture.
Civil Engineering	I.	8	7	6	0
	II.	6	12	4	0
	III.	8	11	4	0
Mining Engineering	I.	8	7	6	0
	II.	5	9	4	0
	III.	4	8	4	0
Mechanical and Electrical Engineering	I.	8	7	0	0
	II	12	7	0	0
	III.	12	10	0	0
Architecture	I.	8	7	2	7
	II.	5	9	0	9
	III.	6	8	0	10
Analytical and Applied Chemistry	I.	4	7	0	0

The above number of drawings will include only such as shall be specially prescribed for the purpose.

These drawings will be prescribed as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the drawings referred to in the preceding table must be made, together with as many others as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum number of drawings shall be 25 and the maximum number 35, except in the Department of Analytical and Applied Chemistry, in which the numbers shall be 15 and 25 respectively.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The drawings must be made on paper 15x22 inches, unless otherwise prescribed.

At the end of each term the drawings must be neatly bound together between covers of approved pattern before they are finally examined, and the students' name, together with his year, term and date, neatly printed on said cover.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the School without permission.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

No field notes will be counted which have not been taken in the field, and during the hours allotted to such work.

The penalties for the infringement of the above two rules will be determined in each case by the Council.

Vacation Work.

Vacation work must be handed in on or before October 8th, otherwise it will not be counted.

Vacation notes must be on construction only, and consist of not less than 20, nor more than 30 pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap, and consist of not less than 20, nor more than 30 pages.

The minimum percentage of marks required for practical work must be made in the case of vacation notes and theses.

No notes, whether taken during the session or the vacation, will be counted unless made in the standard note books of the School.

Theses must be accompanied by carefully made drawings and illustrations separated from the text, and be bound between flat covers.

The sketches for the second year thesis in the Architectural Course are to be made on one side of the sheet of a sketch book and mounted on cardboard or paper 15″ x 22″.

The Architectural students are advised to spend the vacation in an architect's office.

Supplemental Examinations.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examination and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject, he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations in subjects taught by the staff of the school will begin on the second day of the session. In other subjects they will be held at the time of the annual examinations.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year or in graduating will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis evince ignorance on his part of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between 9 a.m. and 5 p.m. at the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted, unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

PRIZES.

Through the liberality of Mr. D. B. Dick, Architect, Toronto, a prize of $10 in books will be open annually for competition in the first year of the Architectural Department.

HONORS.

Honors will be granted in each department to students who pass in all the subjects and obtain at least 66 per cent. of the total number of marks allotted to the department at the annual examinations.

Papers read before the Engineering Society will be considered in granting Honors.

The Honor list will be arranged alphabetically.

REGULAR EXAMINATIONS.

(Approximate Llst.)

I. YEAR.

Examinations held at end of session.

Algebra.
Euclid.
Plane Trigonometry.
Analytical Geometry ....1, 2, 3, 4.
History of Architecture .....4.
Magnetism and Electricity ....3, 5.
Acoustics.....4.
Statics.
Dynamics.
Descriptive Geometry.
Surveying.. ..... 1, 2, 3, 4.
Chemistry, Elementary.
Electricity.....3, 5.

Examinations held during the session.

Drawings.
Field Notes .....1, 2, 4.
Construction Notes .....1, 2, 3 4.
Architectural Sketches .....4.
Experimental Physics.....3, 5.
Practical Chemistry.
French and German.....5.

II. YEAR.

Examinations held at end of session.

Calculus..... .....1, 2, 3, 4.
Astronomy ....1.
Optics.
Hydrostatics.
Heat .....5.
History of Architecture .....4.
Orders of Architecture .....4.
History of Ornament.....4.
Chemistry, Inorganic .....5.
Chemistry, Applied.
Strength of Materials ...1, 2, 3, 4.
Rigid Dynamics .....1, 2, 3.
Theory of Mechanism .....3.
Descriptive Geometry ..1, 2, 3, 4.
Surveying.....1, 2, 4.
Spherical Trigonometry....1, 2, 3.
Mineralogy and Geology .1, 2, 4, 5.
Lithology .....2.
Electricity.....3, 5.
Metallurgy.

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1. Civil Engineering.
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

Examinations held during the session.

Drawing .....1, 2, 3, 4.
Field Notes .....1, 2.
Construction Notes .....1, 2, 3, 4.
Architectural Sketches .....4.
Experimental Physics.
Electricity, Practical .....3.
Thesis (at beginning of session.)
Chemistry, Practical.
Mineralogy, Practical .....1, 2, 5.
French and German.....5.

III. YEAR.

Examinations held at end of session.

Magnetism and Electricity ....3, 5.
History of Architecture .....4.
History of Ornament .....4.
Principles of Decoration .....4.
Method of Least Squares.....1, 3.
Chemistry, Inorganic and Organic, 5.
Chemistry, Applied.
Mineralogy and Geology..1, 2, 4, 5.
Sanitary Plumbing, Heating and Ventilation .....4.
Theory of Compound Stress. 1, 3, 4.
Theory of Construction..1, 2, 3, 4.
Mechanics of Machinery.....3.
Machine Design .....3.
Hydraulics .....1, 2, 3, 4.
Thermodynamics.....1, 2, 3.
Descriptive Geometry ..1, 2, 3, 4.
Practical Astronomy & Geodesy, 1.
Surveying and Levelling ..1, 2, 4.
Metallurgy .....2, 3, 5.
Mining and Ore Dressing .....2.
Ore Deposits.....2.

Examinations held during the session.

Drawings .....1, 2, 3, 4.
Field Notes .....1, 2.
Construction Notes .....1, 2, 3, 4.
Architectural Sketches .....4.
Experimental Physics ....1, 3, 4, 5.
Electricity, Practical .....3.
Thesis (at beginning of session.)
Chemistry, Practical .....2, 5.
Mineralogy, Determinative ..1, 2, 5.
Assaying.....2, 5.

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1. Civil Engineering.
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

I. DEPARTMENT OF CIVIL ENGINEERING.

(*Including Sanitary Engineering.*)

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Sanitary Engineers).

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane-sided solids, Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines.)

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astronomy.

DRAWING.

Subjects of First year continued.
Coloring and Shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry with special reference to industrial applications.
Practical Chemistry.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied.)
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Hydrographic Surveying.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe practice.
Determination of minerals.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 28 and 63.

III. YEAR.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, Arches, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial lighting.
Photography.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
Bridges, Roofs, Floors.
Arches, Retaining Walls.
Foundations, etc.
Thermodynamics and Theory of the Steam Engine.
Hydraulics, Sewerage, Water Supply.
Sanitary Plumbing, Heating and Ventilation.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross sections, Field work and Plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trignometrical and Barometrical Levelling.
Geodesy (considering the earth a sphere).
Practical Astronomy (treated in the manner required for the O.L.S. and D.L.S. Examinations).

MINERALOGY AND GEOLOGY.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

EXPERIMENTAL PHYSICS.

Heat : Specific Heat ; Latent Heat.
Expansion of Air ; Air Thermometer.
Method of Least Squares.

VACATION WORK.

See pages 28 and 63.

II. DEPARTMENT OF MINING ENGINEERING.

This Department is designed to afford the necessary preliminary training to students intending to become Mining Engineers.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane-sided solids. Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The variuos projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials,
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, curves, etc.
Mining Surveying.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.
Lithology.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 28 and 63.

III. YEAR.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.
Laboratory work in Qualitative and Quantitative Analysis.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Thermodynamics and Theory of Steam Engine.
Hydraulics.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross-sections, field work and plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometical and Barometrical Levelling.

Mineralogy and Geology.

Economic Geology.
Palæontology.
Ore Deposits.
Blowpipe Analysis and Determinative Mineralogy.
Metallurgy of Gold, Silver, Nickel, Copper, etc.
Mining and Ore Dressing.
Assaying.

Vacation Work.

See pages 28 and 63.

III. DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

I. YEAR.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

Drawing.

Copying from the flat. Lettering.
Graphics.
Descriptive Geometry in its application to plane-sided solids.
Orthographic (including Isometric) and Oblique Projection.

Chemistry.

Elementary Chemistry with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

(Lectures only.) Applications of Trigonometry and Principles of Measurement.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

DRAWING.

Subjects of first year continued.
Coloring and shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

ENGINEERING.

Statistics and Dynamics (pure and applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials and Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

EXPERIMENTAL PHYSICS.

Heat : Specific Heat ; Latent Heat.
Expansion of Air ; Air Thermometer.
Electricity and Magnetism.
Calculation of Elements of Terrestrial Magnetism
Declination, Dip, and Horizontal Intensity.
Tangent Galvanometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers.

VACATION WORK.

See pages 28 and 63.

III. YEAR.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry :
Shades and Shadows.
Stone cutting.
Perspective Projection.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

ENGINEERING.

Subjects of previous years continued.
Applied Mechanics :
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.

Electricity :

Dynamos and motors.

Application of principles to practical problems connected with the design, construction and testing of various prime motors and machines.

Experimental work in Engineering Laboratory.

METALLURGY.

Gold, Silver, Nickel, Copper, Lead.

EXPERIMENTAL PHYSICS.

Electric Light Photometry.
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.
Method of Least Squares.

ORIGINAL DESIGNS.

Engine and Machine Design.

VACATION WORK.

See pages 28 and 63.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical and Electrical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

IV. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Plane Analytical Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.
Rendering in pencil and pen and ink.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

MECHANICS.

Statics (with reference to structures).
Dynamics (preliminary to the study of hydraulics).

SURVEYING.

Principles, Chain Surveying, Mensuration.

PHYSICS.

Acoustics.

HISTORY OF ARCHITECTURE.

General introduction to subject.
Ancient Architecture.
Egyptian, Assyrian and Persian.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching and Water Color, Pen and Ink.
Descriptive Geometry (curved surfaces).

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

MECHANICS.

Statics (pure and applied).
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory.

SURVEYING.

Use of transit and level.
Mensuration.

MINERALOGY AND GEOLOGY.

Elements.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Uses of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.
Acoustics : Laws of vibrating strings.
Determination of Pitch.
Velocity of Sound.
Electric Fork.
Chronograph.

HISTORY OF ARCHITECTURE.

Greek and Roman.
Romanesque and Byzantine.

ORDERS AND ELEMENTS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

Ancient.
Classic—Greek, Roman.

VACATION WORK.

See pages 28 and 63.

III. YEAR.

DRAWING.

Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Water Color sketching.
Original Designs—Floors, Trusses, Arches, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

THEORY OF CONSTRUCTION.

Experimental work in Engineering Laboratory.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

MINERALOGY AND GEOLOGY.

Economic Geology.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

HISTORY OF ARCHITECTURE.

Gothic and Renaissance, with special reference to England.

History of Ornament.

Early Christian ; Gothic and Renaissance.

Principles of Decoration.

Vacation Work.

See pages 28 and 63.

V. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists or industrial chemists.

I. YEAR.

Mathematics.

Euclid, Algebra, Plane Trigonometry.

Drawing.

Copying from the flat. Lettering.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.
Model Drawing.

Chemistry.

Elementary Chemistry with Laboratory practice.

Mechanics.

Statics and Dynamics.

Physics.

Magnetism and Electricity.

Experimental Physics.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

MODERN LANGUAGES.

French.
German.

II. YEAR.

CHEMISTRY.

Inorganic and Physical Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Heat.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.
Electricity and Magnetism.
Calculation of Elements of Terrestrial Magnetism.
Declination, Dip and Horizontal Intensity.
Tangent Galvánometer.
Use of Voltameter.
Use of Deprez and Thomson Galvanometers.

MODERN LANGUAGES.

French.
German.

VACATION WORK.

See pages 28 and 63.

III. YEAR.

CHEMISTRY.

Organic Chemistry and Chemical Physics.
Applied Chemistry.
Laboratory work.

Mineralogy and Geology.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

Metallurgy.

Gold, Silver, Nickel, Copper, Lead.

Physics.

Electrical Measurements.
Electric Light Photometry.
Ballistic Galvanometer.
Heating Effects of Currents.
Electrometer.

Biology.

Vacation Work.

See pages 28, and 63.

THE FOURTH YEAR.

In order to provide advanced work in the various departments and also to enable students to carry on experimental work in the laboratories with less interruption from attendance at lectures and other causes than is possible in the ordinary three years' course, a sessional course of instruction known as the fourth year has been established.

To be admitted to the fourth year a candidate must be a graduate of of the School of Practical Science or an undergraduate of the standing of the fourth year in the University of Toronto in the Honor Department of Chemistry and Mineralogy.

The subjects of study in the fourth year are arranged in the following groups and sub-divisions:

A. { Astronomy.
{ Geodesy and Metrology.

B. { Architecture.
{ Strength and Elasticity of Materials.
{ Hydraulics.
{ Thermodynamics and Theory of Heat Engines.
{ Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

Each student will be required to confine his studies during the session to one of the above groups. He will not be allowed to take less than two nor more than three of the sub-divisions in any group.

The sub-division " Inorganic and Organic Chemistry " will be obligatory on all students who select group C.

A student is liable to be called on to assist in any of the experimental and practical work in the group which he has selected, although it may not belong to his special subjects.

Candidates are required to notify the Secretary in writing of their intention to take the fourth year work at least one week before the opening of the session, and to inform him at the same time as to the subjects which they propose to take. These subjects will be submitted to the Council for their approval at the beginning of the session, and no student will be permitted to take any subjects not so approved.

Undergraduates of the University of Toronto of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy may be admitted as students in the fourth year in the groups C. and D.

Candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested by their ability to translate extracts from scientific works or periodicals not previously specified.

Pass and Honors.

Total marks assigned to fourth year ..... 900.

Sub-divided as follows :—

Work (reckoned in hours)..... 540 marks.
Records (notes, drawings, etc.) ..... 360 "

For Pass.

The minimum percentages are :—

Work, 75 per cent .... 405 marks.
Records, 50 " ..... 180 "
And two-thirds of the total
marks assigned ..... 600 "

For Honors.

In deciding the allotment of honors the whole academic record of the candidate will be taken into consideration, but no honors will be granted unless the candidate shall have received a special recommendation from the member or members of council under whose supervision his fourth year work has been done.

Honors granted will be mentioned in the certificate required under clause 2 of the statute of the University of Toronto respecting the degree of B.A.Sc.

The above certificate will not be granted to students who have been absent without leave of the Council from more than ten per cent. of the lectures and practical work of either term of the session.

Courses of reading will be indicated in connection with subjects of study.

The above regulations have been approved by the Senate of the University of Toronto in so far as they affect the degree of B.A.Sc.

DEGREE OF B.A.Sc.

Candidates who have fulfilled the requirements of the Fourth Year in the School of Practical Science are eligible for the degree of Bachelor of Applied Science in the University of Toronto in accordance with a statute passed by the Senate in 1892, which, with the amendments since made, is as follows :

By the Senate of the University of Toronto.

Be it enacted :

That the Degree of Bachelor of Applied Science (B.A.Sc.) be hereby established to be granted subject to the following conditions and regulations :

1. Candidates for the said degree shall hold the diploma of the School of Practical Science in any one of the regular courses of the said School, or shall be of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy in the University of Toronto.

2. They shall have fulfilled the conditions relating to the Fourth or Post-Graduate year in the School of Practical Science, and shall present certificates of having done so to the Registrar of the University. Honors may be granted with such certificates by the Faculty of the School.

3. Each candidate shall prepare a Thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University examiners. This Thesis is to be accompanied by all necessary drawings, specifications, tables and estimates. To pass in the Thesis a candidate must obtain 50 per cent., and to take honors 75 per cent., of the marks assigned.

4. Candidates will be required to select two sub-divisions in any one of the following groups, and to pass such written and oral examinations on the subjects selected as may be prescribed by the University examiners.

A. { Astronomy.
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemisty.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all candidates who select group C.

To pass in each subject 33 per cent., and to take honors 66 per cent. of the marks assigned will be required.

5. The degree with honors will be conferred on candidates who obtain three out of the four honors possible.

Viz.—Certificate with honors .....(cl. 2.)
Thesis with honors .....(cl. 3.)
Honors in each subject of examination....(cl. 4.)

6. Candidates are required to send to the Registrar of the University at least three weeks before the commencement of the annual examinations an application for examination according to a printed form to be obtained from the Registrar, and such application must be accompanied by a fee of ten dollars.

7. The examination for the degree shall be held in May.

8. The fee for the degree shall be ten dollars and shall be paid to the Registrar not later than the first day of May.

9. The ordinary time for conferring the degree shall be at the University commencement in June. The degree may be conferred at any meeting of the Senate.

10. The thesis, drawings, and other papers accompanying them, shall be the property of the University.

11. In case any change be made in the conditions referred to in the second clause, such change shall be submitted to the Senate and shall have no force so far as the said clause is concerned unless approved by resolution of the Senate.

For further information apply to the Registrar of the University of Toronto.

DOMINION AND ONTARIO LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Ontario Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and Survey of Lands. (Cap. 152, R. S. O.)

"12.—(2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of

having passed three sessions in the study of the said subjects, be only holden to serve as such apprentice during twelve successive months of actual service ; or, in case he has received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, sufficies to make up the full term of three years.

"(3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law and, if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

"14. The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

"Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service ; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The attention of the Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

Extracts from the Ontario Architects' Act.

"21. Any student who has matriculated in arts in any university in Her Majesty's dominions, or in the Ontario School of Practical Science, shall not be required to pass the preliminary examinations.

"23. Any person who applies for admission to registration as an architect after the coming into force of this Act, shall be not less than twenty-one years of age, shall have served as a student not less than five years with a principal or principals entitled to register under this Act, or with any other principal or principals approved by the council, and have passed such qualifying examinations as may be required by this Act.

"24.—(3) Any person who has graduated from the Ontario School of Practical Science shall be required to serve only three years as a student, one of which three years may be served during the vacation of such school.

"(4) Upon and after the passing of this Act, students shall serve such term as is required to be served by the provisions of this Act, under indenture, to a registered architect, which indenture and any assignment thereof with affidavit of execution thereto attached shall be filed with the registrar upon payment of such fee as the council may, by regulation, direct."

DEGREE OF C. E.

The attention of regular students in the Civil Engineering course is directed to the following Statute, passed by the Senate of the University of Toronto in 1884 :—

By the Senate of the University of Toronto.

Be it enacted :

I. That all previous Statutes of the University relating to Degrees or Diplomas in Civil Engineering, be hereby repealed.

II. That the degree of C. E. be hereby established, to be granted, subject to the following conditions and regulations :

1. Candidates for the said degree shall hold the Diploma in Civil Engineering of the Ontario School of Practical Science.

2. Candidates shall have spent three years after receiving the said Diploma in the actual practice of the profession of Civil Engineering.

3. Candidates shall have spent at least two years of the said period in the construction and operation of engineering works, as distinguished from surveys merely.

4. Satisfactory evidence shall be offered as to the periods spent on the different classes of engineering employments, and intervals during which the candidate was not engaged in the construction or operation of engineering works, or in the prosecution of surveys, shall not be included as portions of the aforesaid period of three years.

5. It shall not be necessary that the several intervals required to make up the period of three years be consecutive.

6. Each candidate shall prepare for the approval of the Senate an original essay on some engineering subject accompanied with detailed explanations, drawings, specifications and estimates; he shall also be examined on the subject of the essay as well as on the work or works on which he has been engaged, unless exempted therefrom on the special recommendation of the examiners.

7. The subject of the said essay shall be forwarded to the Registrar for the approval of the Senate not later than the first day of February.

8. Candidates shall notify the Registrar of their intention of proceeding to the degree of C. E., not later than the first day of April.

9. The evidence required in section 4, together with the essay, drawings and estimates, shall be sent to the Registrar not later than the first day of May.

10. The examination of the essay, drawings and estimates and any further examination of the candidate that may be considered necessary, may be held in May.

11. The fee for the degree of C. E. shall be $20, and shall be paid to the Registrar not later than the first day of May.

12. The essay, drawings and estimates submitted by the candidate, shall be the property of the University.

For further information apply to the Registrar of the University of Toronto.

SYNOPSIS OF THE COURSES OF LECTURES

AND PRACTICAL INSTRUCTION GIVEN IN EACH DEPARTMENT.

With Fees for Special Students.

The same discount for prompt payment will be allowed as in the case of regular students. *See p. 23.*

Special students are advised to enter at the beginning of the session (October 1st), as many subjects begun in the first term are continued through the second, and lectures cannot be repeated.

(Reductions will be made to special students taking several courses.)

☞ Text-books for the first year marked (*a*); for second year (*b*); for third year (*c*) and for fourth or post graduate year (*d*).

DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference.—Davidson—Projections.
Angel—Plane and Solid Geometry.
Binn—Orthographic Projection.
Millar—Descriptive Geometry, (*a*), (*b*).
Warren—Stone Cutting (*c*).
MacCord—Lessons in Mechanical Drawing.
Worthen—Topographical Drawing, (*a*), (*b*), (*c*).

Fees for Special Students, $14.

SURVEYING AND LEVELLING.

LAND SURVEYING.

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING.

Longitudinal and Cross Sections.
Plotting.

SETTING OUT.

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION.

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacities of Reservoirs, etc.

Lectures will also be given on the distinctive features of Mining and Hydrographic Surveying.

Text-Books.—Murray—Manual of Land Surveying (*a*).
Gillespie—Higher Surveying (*b*), (*c*), (*d*).
Henck or Trautwine—Railway Curves (*b*), (*c*).
Johnson—Theory and Practice of Surveying.

Fees for Special Students, $14.

PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE.

The work included in this course is sufficient to fulfil the requirements of the final examination for Provincial and Dominion land surveyors.

In astronomy the principal subjects are the determination of time, latitude and azimuth, and the general principles of the methods of determining longitudes. Practical instruction is given in the methods of taking observations.

In geodesy all surveys, computations and methods of map construction are based upon the supposition that the earth is a sphere.

ADVANCED COURSE (FOURTH YEAR).

The work in this course is intended to fulfil the requirements of the final examinations for Dominion Topographical Surveyors. It is distinguished from the work of the ordinary course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In geodesy the earth is considered as a spheroid.

Text-Books.—Gillespie—Higher Surveying (*b*), (*c*), (*d*).

Green—Spherical and Practical Astronomy (*c*), (*d*).
Chauvenet—Spherical and Practical Astronomy.
Doolittle—Practical Astronomy.
Gore—Elements of Geodesy (*c*), (*d*).
Helmert—Hohere Geodasie.
Nautical Almanac, 1896 (*c*), (*d*).

Fee for Special Students, $19.

APPLIED MECHANICS.

STATICS.

The calculation of the stresses in framed structure, solid and riveted beams, arches, etc. Both graphical and analytical methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS.

THEORY OF COMPOUND STRESS.

DESIGNING OF STRUCTURES in timber, iron and masonry—arches, retaining walls, roofs, bridges, etc.

DYNAMICS.

Representation and measurements of forces and motions.
Principles of work and energy.
Efficiency of machines. Friction.
Transmission of energy—belts, shafts, crank and connecting rod, etc.
Fly-wheels, governors.
Balancing of machinery, etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS—

Discharge of water through orifices, notches, etc. Flow in pipes, and open channels. Sewerage, Water-works, Water-power, Water-wheels, Turbines, Pumps, etc.

THERMODYNAMICS AND THEORY OF THE STEAM ENGINE.

Text-Books and Books of Reference.—Von Ott—Graphic Statics (*a*).
Du Bois—Graphic Statics.
" Strains in Framed Structures.
Johnson—Modern Framed Structures.
Merriman and Jacoby—Roofs and Bridges.
Merriman—Mechanics of Materials (*b*), (*c*), (*d*).
Rankine—Applied Mechanics (*c*), (*d*).
Lanza—Applied Mechanics (*d*).
Baker—Masonry construction (*d*).
Patton—Foundations (*d*).
Kidder—Architect and Builders' Pocket Book.
Low and Bevis—Machine Drawing and Design (*b*), (*c*).
Unwin—Elements of Machine Design (*c*).
Shann—Elementary Treatise on Heat (*c*), (*d*).
Peabody—Thermodynamics (*d*).
" Steam Tables (*d*).
Carpenter—Experimental Engineering (*d*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Merriman—Hydraulics (*c*), (*d*).
Bodmer—Hydraulic Motors, Turbines, etc. (*d*).
Innes—Centrifugal Pumps, Turbines and Water Motors (*d*).
Gerhard—House Drainage and Sanitary Plumbing (*c*).
Santo Crimp—Sewage Disposal Works.
Billings—Heating and Ventilation.
Trautwine—Engineer's Pocket Book.

Fee for Special Students, $19.

THEORY OF MECHANISM.

Principles of the transmission of motion without reference to force.

Pitch surfaces, spur wheels, bevel wheels, skew-bevel wheels, trains of wheelwork, teeth of wheels, cams, cranks, eccentrics, links, bands and pulleys, hydraulic connections, frictional gearing, link motion for slide valves, etc., etc.

Text-Books and Books of Reference.—Rankine—Machinery and Millwork.
Halsey—Slide Valve Gears.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (*c*).

Fee for Special Students, $19.

ELECTRICITY.

Instruction will be given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University. The work will comprise :—

ELEMENTARY ELECTRICITY AND MAGNETISM.

MEASURING INSTRUMENTS—

Theory and uses in determining current, electromotive force, resistance, capacity, strength of field, magnetic inductance, etc., etc.

MATHEMATICAL THEORY OF ELECTRICITY.

APPLICATIONS OF ELECTRICITY—

Laboratory work and lectures on telegraph, telephone, dynamos, electric lighting ; arc and incandescent systems, storage batteries, transmission of power by electricity, etc.

THEORY OF ALTERNATING CURRENT GENERATORS AND TRANSFORMERS.

Text-Books and Books of Reference.—Kennelly and Wilkinson—Practical Notes for Electric Students (*a*), (*b*).
Stewart & Gee—Practical Physics (*b*).
Kempe—Electrical Testing (*b*).
Cumming—Theory of Electricity (*c*).

Thompson, S. P.—Dynamo Electric Machinery (*c*), (*d*).
Kapp—Electric Transmission of Energy (*d*).
Blakesley—Alternating Currents (*d*).
Bedell and Crehore—Alternate Currents (*d*).
Fleming—Alternate Current Transformers, Vol. I. and II. (*d*).

Current numbers of the "Electrician," the "Electrical World," and "La Lumiere Electrique."

Fee for Special Students, from $19 to $34.

ARCHITECTURE.

History of Architecture—

Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

Orders of Architecture.

History of Ornament.

Principles of Decoration.

Text-Books and Books of Reference.—T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Fergusson—History of Architecture.
Rickman—Gothic Architecture.
Gwilt—Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture (*b*), (*c*).
Leeds—Orders of Architecture (*b*).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.

Fee for Special Students, $19.

MATHEMATICS.

The Pure Mathematics included in this course will be taught in the University of Toronto.

The Applied Mathematics will be taught partly in the University and partly in the school.

Text-Books and Books of Reference.—Todhunter—Algebra (*a*).
" Spherical Trigonometry (*b*).
Mackay—Elements of Euclid (*a*).
Hall & Knight—Plane Trigonometry (*a*).
C. Smith—Conic Sections (*a*).
Osborne—Calculus.
Loomis—Calculus (*b*).
Newcomb & Holden—Astronomy (*b*).
Ganot—Physics (*b*).
Hamblin Smith—Hydrostatics (*b*).
Balfour Stewart—Heat.
London & McLennan—Practical Physics (*b*).
Tyndall—Sound.

CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

Courses by the Professor of Chemistry of the University of Toronto.

Inorganic Chemistry.
Organic Chemistry.
Chemical Theory.
Physical Chemistry.

Courses by the Professor of Applied Chemistry of the School of Practical Science.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuel, Furnace, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air, Sewage, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis of Food, Water and Air, and Toxicology.

Text-Books and Books of Reference.—Remsen—Inorganic Chemistry.
Richter—Inorganic Chemistry.
Richter—Organic Chemistry.
Roscoe & Schorlemmer—Treatise on Chemistry.
Miller, W. A.—Elements of Chemistry.
Meyer—Modern Theories of Chemistry.
Ostwald—Lehrbuch der Allgemeinen Chemie.
Ostwald—Outlines of General Chemistry.
Beilstein—Organic Chemistry.
Von Meyer & Jacobson—Lehrbuch der Organischen Chemie.
Thomson—History of Chemistry.
Wagner—Chemical Technology.
Sadtler—Organic Applied Chemistry.
Bloxam—Chemistry.
Fresenine—Qualitative and Quantitative Analysis.
Douglas & Johnson—Qualitative Analysis.
Sutton—Volumetric Analysis.
Jones—Practical Chemistry.
Allen—Commercial Organic Analysis.
Post—Chemischen Lechmschen Analysis.
Winkler—Gas Analysis.
Blyth, A. W.—Poisons.
Blyth, A. W.—Foods.
Balley—Handbuch der Chemischen Technologie.
Watt—Dictionary of Chemistry.
Thorpe—Dictionary of Applied Chemistry.
Meyer—History of Chemistry.
Wurtz—History of Chemical Theory.
Wurtz—Atomic Theory.
Vau't Hoff—Chemistry in Space.
Pattison Muir—Thermo-Chemistry, Elements of.

Fee for Special Students $34 to $54.

MINERALOGY AND GEOLOGY.

MINERALOGY, GEOLOGY, MINING AND METALLURGY.

1. Mineralogy and Geology—
   Mineralogy and Crystallography.
   Geology and Palæontology.
   Lithology.
   Physical Geography.
   Blowpipe Analysis.
   Determinative Mineralogy.

Text-Books and Books of Reference.—Chapman—Mineralogy and Geology of Canada.
Dana—Manual of Geology.
Dana—System of Mineralogy.
Nicholson—Palæontology.
Geikie—Text-Book of Geology.
Plattner—Manual of Blowpipe Analysis.
Chapman or Brush—Mineral Tables.

2. Mining and Metallurgy—
Mining Geology.
Ore Dressing.
Metallurgy of Iron and Steel.
Metallurgy of Nickel, Copper, Silver, etc.
Assaying.

Text-Books and Books of Reference.—Ihlseng—Manual of Mining.
Kœhler—Bergbaukunde.
Kuhnhardt—Ore Dressing.
Phillips—Ore Deposits.
Balling—Metallhuettenkunde.
Schnabel—Allgemeine Huettenkunde.
Phillips and Bauerman—Elements of Metallurgy.
Mitchell—Assaying by Crookes.
Kerr—Probirkunst.
Kemp—Ore Deposits of the United States.

Fee for Special Students, $19 to $54.

VACATION WORK.

Thesis and Construction Notes.

A subject will be given at the end of each session on which the student will be required to write a thesis (accompanied by drawings and specifications when necessary) during the subsequent vacation.

The engineering and architectural students will also be required to make, during the vacation, full and clear notes of various constructions that may fall under their notice.

The value of both the thesis and the construction notes will be taken into account in determining standing at the next following examination.

Civil Engineering.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" *Third* " Sanitary Drainage.

Books of Reference.—Gillmore—Roads, Streets and Pavements.
Spalding—Roads and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Mechanical and Electrical Engineering.

Subject of Thesis for Second Year.—Machine-shop Practice.
" *Third* " Foundry Practice.

Books of Reference.—Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

Mining Engineering.

Subject of Thesis for Second Year.—Ore-dressing.
" *Third* " Mining.

Books of Reference.—Kuhnhardt—Ore-dressing in Europe.
Ihlseng—Manual of Mining.

Architecture.

For the second year the following set of freehand pencil sketches will be required :

I. Doorway from the object ;
II. Staircase "
III. Fireplace, with cross sections ;
And seven sheets from the object, prints or drawings, with plans and sections where possible.

Subject of Thesis for Second Year.—The above sketches.
" " *Third* " Twelve water-color studies.

Analytical and Applied Chemistry.

Subject of Thesis for Second Year.—Sulphuric Acid and Alkali Manufacture.
" *Third* " Coal Tar Products.

Books of Reference.—Lunge—Manufacture of Sulphuric Acid and Alkali.
Wagner—Chemical Technology.
Thorpe—Dictionary of Applied Chemistry.

Any other works on the above subjects may be consulted and results of original observations should be given.

ENGINEERING LABORATORY.

This Laboratory occupies two floors, having a total area of 10,000 square feet. It consists of three departments, viz. :

(*a*) The department for testing materials of construction.

(*b*) The department for investigating the principles governing the application of power. This department is sub-divided into the steam laboratory, the hydraulic laboratory and electrical laboratory.

(*c*) The department for investigating problems connected with standards of length, time, astronomical observations, etc.

In order to prepare specimens for the testing machines, a shop has been fitted up with a number of high-class machine tools specially suited for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labor. It is also supplied with the necessary appliances for making ordinary repairs.

The machines in the department for testing materials are the following :

An Emery 50-ton machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A Riehle 100-ton machine for making tests in tension, compression, shearing and cross-breaking. It will take in posts twelve feet long and beams up to eighteen feet in length.

An Olsen torsion machine for testing the strength and elasticity of shafting. This machine will twist shafts up to sixteen feet in length and two inches in diameter.

A Riehle 2,000 pounds cement testing machine. The cement testing room is fitted with all the usual accessories.

The equipment of the power department is as follows :

A Babcock and Wilcox 52-horsepower boiler.

A Harrison Wharton 12-horsepower boiler.

A 50-horsepower Brown Engine. This engine was constructed specially for experimental investigation. It is steam jacketted and has three alternative exhausts, to the open air, to a jet condenser, and to a Wheeler

surface condenser, kindly presented to the School by Mr. F. M. Wheeler, of New York, the inventor.

There are also a Blake circulating pump, a Knowles air pump and a Blake feed pump, the latter of which was a gift from the manufacturers.

A machine for testing lubricating oils and measuring journal friction, built by Riehle Bros., of Philadelphia.

The hydraulic division of the laboratory is furnished with a three-throw pump with double acting cylinders. It has a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices and weirs measuring tanks, etc. A three-feet jet turbine and a six-inch reaction turbine, the latter the gift of the firm of William Kennedy & Sons, Owen Sound, form a part of the same equipment.

The electrical division of the laboratory is equipped with the following dynamos :

Two Edison machines, a Ball, a Thomson-Houston, two Gulcher machines, a Westinghouse alternator with transformers, a Crocker-Wheeler and a Kay motor, also two small fan motors.

There are also a Roberts storage battery, a gravity primary battery and a good equipment of lamps, arc and incandescent, of different types. Also a variety of electrical measuring apparatus, including a Thomson electrical balance.

The power department is equipped with the usual measuring instruments, indicators, gauges, gauge testing apparatus, scales, brakes, dynamometers.

The shafting is driven by a 7-horsepower Otto gas engine, a 20 kw. Edison motor, and the Brown engine above described.

In the geodetic and astronomical department are a 100-feet and a 66-feet standard of length ; a 10 foot Rogers comparator with graduating attachment ; a Howard astronomical clock and electro-chronograph ; a Troughton & Simms 10-inch theodolite and all the ordinary surveying instruments.

THE CHEMICAL LABORATORIES.

The chemical laboratories comprise a laboratory for qualitative analysis with accommodation for 40 students working at one time, a laboratory for quantitative analysis capable of accommodating 20 students and smaller rooms for special work such as water analysis, technical gas analysis, etc. The laboratories are fitted with the usual appliances.

BLOWPIPE AND ASSAYING LABORATORIES.

Six rooms are provided in this department, including a blowpipe laboratory with tables and other appliances for 15 students; an assaying laboratory with gas and charcoal furnaces; a balance room, titration laboratory and store-rooms with the equipment necessary for wet and dry assays. Lithological microscopes and a lathe with all necessary facilities for the preparation and study of thin rock sections have been provided.

PHYSICAL LABORATORY.

(University of Toronto.)

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of mechanics, sound, light, heat and electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an elementary laboratory, there are several special laboratories, which offer unusual facilities for the conduct of experiments in the various branches of physics.

The electrical apparatus includes electrometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre), Ruhmkorff coils, Crookes' tubes, telephones, etc., etc.

MODERN LANGUAGES.

No special examinations are held in these languages except in the Fourth Year, but it is expected that every student in a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARY, MUSEUMS, ETC.

The Library is supplied with a number of the more important scientific and technical periodicals. A small but valuable collection of works of reference on the subjects of study pursued in the School has been formed and is being added to year by year.

Several thousand specimens have been procured for the museum, which now contains mineralogical, lithological, metallurgical, and palæontological collections, affording a wide range of material for instruction in the subjects of Mineralogy, Geology and Metallurgy.

The large and valuable exhibit of minerals sent by the Ontario Government to the Columbian Exhibition at Chicago has been presented to the School.

A beginning has also been made in the collection of specimens illustrating Industrial Chemistry and Architecture.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1894-5.

President	A. E. Blackwood.
Vice-President	J. Armstrong.
Secretary	C. F. King.
Treasurer	T. D. Wright.
Corresponding Secretary	F. J. Robinson.
Librarian	F. W. Guernsey.
Representatives—Graduates	J. Keele, B.A.Sc.
Fourth Year	R. W. Angus.
Third Year	R. J. Campbell.
Second Year	J. A. Stewart.
First Year	E. A. Weldon.

The Society meets every second Wednesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

ALUMNI ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

OFFICERS FOR 1894.

President	James McDougall, B.A.
First Vice-President	H. E. T. Haultain.
Second Vice-President	J. W. Tyrrell, C.E., O.L.S.
Councillors	W. L. Innes, C.E., O.L.S.
	J. D. Shields.
	A. J. McPherson, B.A.Sc.
	R. McDowall, O.L.S.
	H. F. Ballantyne, B.A.Sc.
Secretary-Treasurer	A. T. Laing, B.A Sc.

Graduates are requested to keep the Secretary acquainted with their addresses.

ELECTRICAL ASSOCIATION.

Honorary President	T. R. Rosebrugh, M.A.
President	H. S. Hull.
Secretary-Treasurer	Geo. Brebner.
Fourth Year Representative	H. E. Job.
Third Year "	R. G. Black.
Second Year "	E. I. Sifton.
First Year "	A. Sanderson.

SESSION 1894-95.

STUDENTS IN ATTENDANCE.

REGULAR STUDENTS.

DEPARTMENT OF CIVIL ENGINEERING.

1st Year.

Weldon, E. A. Weekes, M.

2nd Year.

Carpenter, H. S.
Crews, H. R.
Laing, W. F.
Johnson, G.
Martin, T.
Proudfoot, H. W.
Poussett, H. R.
Stewart, J. A.
Webster, E. B.

3rd Year.

Armstrong, J.
Boswell, E. J.
Dobie, J. S.
Guernsey, F. W.
Meadows, W. W.
Robinson, F. J.
Sims, H. B.

DEPARTMENT OF MINING ENGINEERING.

1st Year.

Andrewes, E.
Betty, H. K.
Bow, J. A.
Robinson, A. H.
Stull, W. W.

2nd Year.

Bain, J. W. Burwash, L. T. DeCew, J. A. Mollins, C. B.

3rd Year.

McPherson, C. W.

DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

1st Year.

Allan, A. A.
Atkinson, G. D.
Alexander, F. H.
Bain, J. A.
Gray, A. T.
Irvine, C. A.
King, C. F.
Lavrock, J. E.
Lawrie, C. L.
Morrison, H.
Richards, E.
Stacey, G. E.
Smillie, R.
Vercoe, H. L.
Taylor, H. P.

2nd Year.

Brown, R. M.
Blackwood, C. K.
Campbell, G. M.
Elliott, H. P.
Fowler, C. P.
Gurney, W. C.
Haight, H. V.
Harman, O. E.
Lawrie, R. R.
Macbeth, C.
MacMurchy, J. A.
Sifton, E. J.
Shipe, R. R.
Shipe, E. F.
Wade, H. R.
Watson, J. W.

3rd Year.

Black, R. G.
Blackwood, A. E.
Brown, L. L.
Brodie, W. M.
Brebner, G.
Connor, A. W.
Gray, R. L.
Hull, H. S.
Hudspeth, W. S.
McGowan, J.
McKinnon, H. L.
McKay, W. N.
Stocking, F. T.
Moore, I. E.
Tremaine, R. C. C.

DEPARTMENT OF ARCHITECTURE.

1st Year.

Morphy, E. J.

2nd Year.

Forward, E. A.

3rd Year.

Campbell, R. J.
Harkness, A. H.

DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

1st Year.

Charlton, H. W.

2nd Year.

Smith, V. S.

FOURTH OR POST-GRADUATE YEAR.

Beauregard, A. T.
Bergey, A. E.
Bucke, W. A.
Ewart, J. A.
Herald, W. J.
Johnson, S. M.
Johnston, A. C.
Job, H. E.
McAllister, J. E.
McTaggart, A. L.
Minty, W.
Shields, J. D.

SPECIAL STUDENTS.

CIVIL ENGINEERING.

Chaplin, G. W.
Cooper, G. E.
Gzowski, C. S.
Owen, D. T.
Troup, W. J.
Rougvie, A.
Troup, G. E.
Tye, A. T.

MINING ENGINEERING.

Evans, R. B.

MECHANICAL AND ELECTRICAL ENGINEERING.

Armstrong, F. A.
Conklin, R. C.
Corbould, C. D.
Hicks, W. A. B.
Jameson, A. P.
McCullough, A. W.
Moriarty, J. J.
Piper, A. G.
Perry, F. M.
Poliwka, H. B.
Stovel, H. R.
Sheldon, S.
Sanderson, A.
Wright, T. D.

ARCHITECTURE.

Charters, W. C.
Horetzky, R.
Clark, J. T.
Scott, W. F.

MINERALOGY AND GEOLOGY.

Horton, A.
Wallbridge, C. M.

MINING AND METALLURGY.

Fee, J. J.

ASSAYING.

Thomson, R. W., B.A.Sc.
Hoeper, V., Ph.D.

CHEMISTRY.

Gray, J. M.

PRIZEMEN.

Engineering.

1879.—	I.	Year	J. McAree	1st prize.
1880.—	II.	Year	J. L. Morris	1st prize.
1881.—	I.	Year	G. H. Duggan	1st prize.
	II.	Year	D. Jeffrey	1st prize.
1882.—	I.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	II.	Year	G. H. Duggan	1st prize.
	III.	Year	D. Jeffrey	1st prize.
1883.—	I.	Year	B. A. Ludgate	1st prize.
	"	"	A. M. Bowman	2nd prize.
	II.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	III.	Year	G. H. Duggan	1st prize.
1884.—	II.	Year	B. A. Ludgate	1st prize.
	III.	Year	E. W. Stern	1st prize.
	"	"	A. R. Raymer	2nd prize.
1885.—	I.	Year	A. F. Lott	1st prize.
	"	"	J. Roger	2nd prize.
	II.	Year	T. K. Thomson	1st prize.
	III.	Year	B. A. Ludgate	1st prize.
1886.—	I.	Year	C. H. C. Wright	1st prize.
	"	"	J. E. Ross	2nd prize.
	II.	Year	A. E. Lott	1st prize.
1887.—	I.	Year	H. E. T. Haultain	1st prize.
	II.	Year	C. H. C. Wright	1st prize.
	III.	Year	A. E. Lott	1st prize.
	"	"	J. Roger	2nd prize.
1888.—	I.	Year	E. B. Merrill	1st prize.
	"	"	F. M. Bowman	2nd prize.
	II.	Year	D. D. James	1st prize.
	III.	Year	C. H. C. Wright	1st prize.

1889.—	I.	Year	J. K. Robinson	1st prize.
	"	"	G. E. Silvester	2nd prize.
	II.	Year	E. B. Merrill	1st prize.
	"	"	F. M. Bowman	2nd prize.
	III.	Year	D. D. James	1st prize.
1890.—	I.	Year	C. Fairchild	1st prize.
	II.	Year	J. K. Robinson	1st prize.
	III.	Year	F. M. Bowman	1st prize.
	"	"	E. B. Merrill	2nd prize.
1891.—	I.	Year	A. J. McPherson	1st prize.
	"	"	R. B. Watson	2nd prize.
	II.	Year	J. B. Goodwin	1st prize.
	III.	Year	G. E. Silvester	1st prize.
	"	"	C. W. Dill	2nd prize.
1892.—	I.	Year	A. E. Bergey	1st prize.
	"	"	R. W. Angus	2nd prize.
	II.	Year	A. J. McPherson	1st prize.
	"	"	R. B. Watson	2nd prize.
	III.	Year	E. J. Laschinger	1st prize.
	"	"	C. Fairchild	2nd prize.

The grant for prizes was withdrawn at the close of 1892.

Architecture.

The prize in Architecture is the gift of Mr. D. B. Dick, Architect, Toronto.

1891.—	I.	Year	H. Ballantyne.
1892.—	I.	Year	J. A. Ewart.
1893.—	I.	Year	A. Harkness.
1894.—	I.	Year	E. A. Forward.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

CIVIL ENGINEERING.

1881.—Morris, J. L., C.E., O.L.S.,
Pembroke, Ont.

1882.—Jeffrey, D., Contractor,
Stratford, Ont.
Kennedy, J. H., C.E., O.L.S., Architect, etc.,
St. Thomas, Ont.
McAree, J., B.A.Sc., O.L.S., D.T.S.,
536 Ontario St., Toronto.

1883.—Burns, D., O.L.S., A. M. Can. Soc. C.E.,
Engineer's Staff, Pennsylvania Co., Pittsburgh, Pa.
Duggan, G. H., M. Can. Soc. C.E.,
Chief Engineer, Dominion Bridge Co., Montreal.
Tyrrell, J. W., C.E., D. & O.L.S.,
42 James St. N., Hamilton, Ont.

1884.—Kirkland, W. C.,
Illinois Central Ry., New Orleans, La.
McDougall, J., B.A.,
County Engineer, Court House, Toronto.
Raymer, A. R.,
Engineer's Office, Lake Shore and Michigan Southern R.R., Toledo, Ohio.
Robertson, J., O.L.S.,
Coad & Robertson, Civil Engineers, P. L. Surveyors, etc., Glencoe, Ont.
Stern, E. W.,
Engineer Scharpe & Kohen Architectural Iron Co., St. Louis, Mo.

1885.—Bleakley, F. W.,
Room 46, Sullivan Block, Seattle, W. T.
Bowman, H. J., D. & O.L.S., A.M. Can. Soc. C.E.,
Town Engineer, Berlin, Ont.
Henderson, E. E., O.L.S.,
Henderson P.O., Piscatiquois, Me.

1885.—Ludgate, B. A., O.L.S.,
Denison, Texas.
McKay, O., O.L.S.,
Windsor, Ont.

1886.—Bowman, A. M., D. & O.L.S.,
Staff U. S. Engineers, Ohio River Improvement, Vanport, Pa.
Hermon, E. B., D. & O.L.S.,
Gordon, Hermon & Burwell, Vancouver, B.C.
Laird, R., O.L.S.,
Assistant to Waterworks Engineer, City Hall, Toronto.
Thomson T. K., C.E.,
Consulting Engineer, Stamford, Conn.
Tyrrell, H. G., C.E.A.M. Can. Soc. C.E.,
Berlin Iron Bridge Co., East Berlin, Conn.

1887.—Burns, J. C. (Deceased).
Lott, A. E.,
Railway Construction, San Antonio de la Huerta, Mexico.
McCullough, A. L., O.L.S., A.M. Can. Soc. C.E.
Resident Sewerage Engineer, West Toronto Junction.
Martin, F., O.L.S., M.B.,
Hospital for Sick Children, Toronto.
Pinhey, C. H., D. & O.L.S.,
Soulanges Canal, Coteau Landing, P. Q.
Roger, J., O.L.S.,
Mitchell, Ont.

1888.—Apsey, J. F., O.L.S.,
242 W. Biddle St., Baltimore, Md., U.S.
Ashbridge, W. T.,
City Engineer's Office, Toronto.
Ball, E, F., A.M. Can. Soc. C.E.,
Resident Engineer, Canon City Coal Co., Rockvale, Co.
Brown, D. B., O.L.S.,
Mexican Southern Railway, Old Mexico.
Canniff, C. M.,
City Surveyor's Office, Toronto.
Chewett, H. J., C.E., B.A.Sc., A.M. Can. Soc. C.E.
83 York St., Toronto, Ont.
Gibbons, J., D. & O.L.S.,
Department of the Interior, Ottawa, Ont.
McDowall, R., O.L.S., A.M. Can. Soc. C.E.,
Owen Sound, Ont.

McFarlane, G. W., O.L.S.,
Assistant County Engineer, Court House, Toronto.
Marani, C. J.,
Canada Permanent Loan Co., Vancouver.
Mickle, G. R., B.A.,
Mining Engineer, Sudbury, Ont., Lecturer in Mining, School of Practical Science.
Moore, J. H., O.L.S ,
Smith's Falls, Ont.
Richardson, G. H.,
36 St. Joseph St., Toronto, Ont.
Rose, K.,
Mexican Southern Railway, Tonilla, Est-de-Jalisco, Mexico.
Ross, J. E., O.L.S.,
Riverside, Cal.
Wright, C. H. C., B.A. Sc.,
Lecturer in Architecture, S.P.S., Toronto.

1889.—Carey, B.,
Engineer's Office, Toronto, 30 Russell St.
Chalmers, W. J.,
Cayuga, Ont.
Clement, W. A.,
City Engineer's Office, Toronto.
Hanning, G. F.,
City Engineer's Office, Toronto.
Haultain, H. E. T.,
Consulting Mining and Electrical Engineer, Kaslo, Kootenay, B.C.
Irvine, J.,
Harriston, Ont.
James, D. D., B.A. Sc., O.L.S.,
19½ Richmond St. E., Toronto, Ont.
Mill, F. X.,
286 Main St. E., Pittsburg, Pa., U.S.
Moberly, H. K.,
Frostburg, Va., U.S.A.
Rosebrugh, T. R., M.A.,
Lecturer in Electrical Engineering, S.P.S., Toronto.
Wickett, T.,
University Medical College, Toronto.

1890.—Bowman, F. M., O.L.S., C.E.,
Assistant Engineer, Riter & Conley, Alleghany, Pa.
Bucke, M. A.,
Mining Engineer, Kaslo, B.C.
Corrigan, G. D.,
Box 292, Vancouver, B.C.
Duff, J. A., B A.,
Lecturer in Applied Mechanics, School of Practical Science, Toronto, Ont.
English, A. B.,
106 Gould St., Toronto.
Garland, N. L.,
Eglington, Ont.
Hutcheon, J., O.L.S.,
City Engineer, Guelph, Ont.
Innes, W. L., O.L.S., C.E.,
Ranney & Innes, Civil Engineers and Surveyors, Pe'erboro', Ont.
Merrill, E. B., B.A., B.A. Sc.,
Principal Toronto Technical School.
Pedder, J. R., O.L.S.,
J. Galt, C.E., Toronto.
Wiggins, T. H., O.L.S.,
Saunders & Wiggins, Civil Engineers and Surveyors, Brockville, Ont.
Withrow, W. J.,
Fetherstonhaugh & Co., Toronto.

1891.—Beatty, H. J., O.L.S.,
Engineer's Staff, Atlantic & N. W. Division C.P.R., Pembroke, Ont.
Deacon, T. R , O.L.S.,
Rat Portage, Ont.
Dill, C. W.,
Tonawanda, N. Y., U. S.
Lane, A.,
N. J. Steel & Iron Co., Trenton, N. J., U. S.
McAllister, J. E.,
School Practical Science (Post-graduate course)
Moore, J. E. A.,
407 University Ave., S. E. Minnea, U. S.,
Newman, W., O.L.S.,
Maycock & Newman, Windsor, Ont.

Robinson, J. K., Deceased.
Russel, W.,
Engineer's Staff O. A. & P. S. R'y, Pembroke, Ont.
Silvester, G. E., O.L.S.,
Ringwood, Ont.
Symmes, H. D.,
Engineer Street Ry., St. Catharines, Ont.

1892.—Allan, J. R., O.L.S.,
Renfrew, Ont.
Alison, T. H., B.A. Sc.,
Peterborough Bridge Works, Peterborough, Ont.
Anderson, A. G.,
Boston Bridge Co., 61 Hancock St., Boston, Mass.
Fairchild, C.,
City Engineer's Office, Brantford, Ont.
Goodwin, J. B., B.A. Sc.,
L.S. & M.S.R.R., Toledo, Ohio.
Laschinger, E. J., B.A. Sc.,
Fellow in Mechanical Engineering, School of Practical Science, Toronto.
Laing, A. T., B.A. Sc.,
Fellow in Surveying, School of Practical Science, Toronto, Ont.
McEntee, B., B.A. Sc.,
28 Queen St. E., Toronto.
Mitchell, C. H., B.A. Sc.,
Niagara Falls, Ont.
Playfair, N. L.,
131 Isabella St., Toronto, Ont.
Prentice, J. M., Deceased.
Ross, J. A.,
Engineer's Staff, L.S. & M.S. Ry., Toledo, O.
Smith, A.,
Napanee, Ont.
Thomson, R. W., B.A. Sc.,
Toronto Technical School.

1893.—Ardagh, J. A.,
Bowman, J. H.
Box 337, Berlin, Ont.
Brown, G. L.,
Morrisburg, Ont.

Charlesworth, L. C.,
Assistant to E. Stewart, Collingwood, Ont.
Dunn, T. H.,
Arkona, Ont.
Fairbairn, J. M. R.,
Peterborough, Ont.
Forester, C.
Gormley, Ont.
Francis, W. J.
Grand Trunk Railway, Toronto.
Laidlaw, J. T., B.A. Sc.,
St. Albans St., Toronto, Ont.
McFarlen, T. J.,
10 St. Vincent St., Toronto, Ont.
McPherson, A. J., B.A. Sc.,
Waterworks Engineer, Galt, Ont.
McAllister, A. L., B.A. Sc.,
99 Wilcox St., Toronto, Ont.
Macallum, A. F.,
Toronto Technical School.
Main, W. T.,
Brampton, Ont.
Marani, V. G.,
Staff of City Engineer, Cleveland, O.
Mines, W.,
Mount Brydges, Ont.
Russel, R.,
Engineer's Staff, O. A. & P. S. Ry., Pembroke, Ont.
Speller, F. N., B.A. Sc.
Squire, R. H., B.A. Sc.
Taylor, W. V.,
Rathbun Co., Gananoque, Ont.
Watson, R. B.,
Messrs. Riter & Conley, Allegheny, Pa.

1894.—Barker, H. F.,
Orillia, Ont.
Bergey, A. E.,
School of Practical Science (Post-graduate course).
Chalmers, J.,
Owen Sound, Ont.
Jones, J. E.,
Barrie, Ont.

Johnson, S. M.,
School of Practical Science (Post-graduate course).
McTaggart, A. L.,
School of Practical Science (Post-graduate course).
Rolph, H.,
480 Huron St., Toronto, Ont.
Shields, J. D.,
School of Practical Science (Post-graduate course).
Smith, Angus,
Ridgetown, Ont.

MECHANICAL AND ELECTRICAL ENGINEERING.

1890.—Ross, R. A.,
Royal Electrical Co., Montreal, P.Q.

1891.—Merrill, E. B., B.A. Sc.,
Principal Toronto Technical School.

1892.—Lea, W. A., B.A. Sc.,
Supt. Galt & Preston Electric Ry., Galt, Ont.
Milne, C. G., B.A. Sc.,
286 Main St., Pittsburg, Pa.
White, A. V.,
Edison General Electric Co., Peterborough, Ont.

1893.—Goldie, A. R.,
Goldie & McCullough, Galt, Ont.
Hanly, S. C.,
Waubashene, Ont.
Lash, F. L.,
Engineer, Sugar Factory, Boedoeran, Java.
Robertson, J. M.,
62 Admiral Road, Toronto, Ont.

1894.—Angus, R. W.,
Fellow in Electrical Engineering, School of Practical Science, Toronto.
Boyd, D. G.,
119 Bloor St. E., Toronto, Ont.
Beauregard, A. T.,
School of Practical Science (Post-graduate course).
Bucke, W. A.,
School of Practical Science (Post-graduate course).
Herald, W. J.,
School of Practical Science (Post-graduate course).

Job, H. E.,
School of Practical Science (Post-graduate course.)
Johnston, A. C.,
School of Practical Science (Post-graduate course).
Lash, N. M.,
Bell Telephone Co.
31 Breadalbane St., Toronto, Ont.
Minty, W.,
School of Practical Science (Post-graduate course).
Nicholson, C. J.,
156 George St., Hamilton, Ont.
Spotton, A. K.,
Waterous Engine Works, Brantford, Ont.
Wright, R. T.,
Box 485, Owen Sound, Ont.

ARCHITECTURE.

1892.—Langley, C. E.,
Langley & Langley, Architects, Toronto.

1893.—Ballantyne, H. F., B. A. Sc.,
Ottawa, Ont.
Fingland, W.,
307 W. 119th St., New York.
Keele, J., B.A. Sc.,
Fellow in Engineering, School of Practical Science, Toronto, Ont.

1894.—Ewart, J. A.,
School of Practical Science (Post-graduate course).

ANALYTICAL AND APPLIED CHEMISTRY.

1890.—Boustead, W. E., B.A. Sc.
Fellow in Metallurgy and Assaying, S.P.S., Toronto.

1891.—James, O. S., B.A. Sc.,
102 Howard St., Toronto, Ont.

1892.—Lawson, W., B.A. Sc.,
Fellow in Chemistry, School of Practical Science, Toronto.

UNIVERSITY OF TORONTO.

Degree of C. E.

Date of Admission.	
1885	J. L. Morris.
1886	J. H. Kennedy.
1889	J. W. Tyrrell.
1892	T. K. Thomson.
1892	H. J. Chewett.
1893	W. L. Innes.
1893	F. M. Bowman.
1894	H. G. Tyrrell.

Degree of B.A.Sc.

Date of Admission.	
1893	Alison, T. H.
1893	James, O. S.
1893	Laing, A. T.
1893	Laschinger, E. J.
1893	Lawson, W.
1893	Lea, W. A.
1893	McAree, J.
1893	McEntee, B.
1893	Milne, C. G.
1893	Thomson, R. W.
1893	Wright, C. H. C.
1894	Ballantyne, H. F.
1894	Chewett, H. J.
1894	Goodwin, J. B.
1894	James, D. D.
1894	Keele, J.
1894	Laidlaw, J. T.
1894	McPherson, A. J.
1894	McAllister, A. L.
1894	Merrill, E. B.
1894	Mitchell, C. H.
1894	Speller, F. N.
1894	Squire, R. H.

SCHOOL OF PRACTICAL SCIENCE TORONTO.

CALENDAR

OF THE

SCHOOL OF PRACTICAL SCIENCE,

OF THE

PROVINCE OF ONTARIO,

TORONTO.

(AFFILIATED TO THE UNIVERSITY OF TORONTO.)

19th SESSION, 1896–1897.

TORONTO:
PRINTED BY WARWICK BROS. & RUTTER, 68 AND 70 FRONT STREET WEST.
1896.

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1896

SEPTEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	..	..	..
..	..	..	..	..	..	..

25. Meeting of Council.
28. **Entrance Examinations** begin.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
.	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	**14**	15	16	17
18	19	20	21	22	23	24
25	26	27	**28**	29	30	31
..	..	..	..	..	..	..

1. **FIRST TERM** begins.
2. Supplemental Examinations begin.
9. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	**11**	12	13	14
15	16	17	18	19	20	21
22	23	24	**25**	26	27	28
29	30	..	..	..	..	..
..	..	..	..	..	..	..

13. Meeting of Council.

1897

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	.	1	2	3	4	5
6	7	8	**9**	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	..	..
..	..	..	..	..	..	..

11. Meeting of Council.
23. **FIRST TERM** ends.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	**13**	14	15	16
17	18	19	20	21	22	23
24	25	26	**27**	28	29	30
31	..	..	..	..	..	..

8. **SECOND TERM** begins.
8. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	**10**	11	12	13
14	15	16	17	18	19	20
21	22	23	**24**	25	26	27
28	..	..	..	..	..	..
..	..	..	..	..	..	..

12. Meeting of Council.

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	**10**	11	12	13
14	15	16	**17**	18	19	20
21	22	23	24	25	**26**	27
28	29	30	31	..	..	..
..	..	..	..	..	..	..

3. Ash-Wednesday. Building closed.
12. Meeting of Council.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	..
..	..	..	..	..	..	..

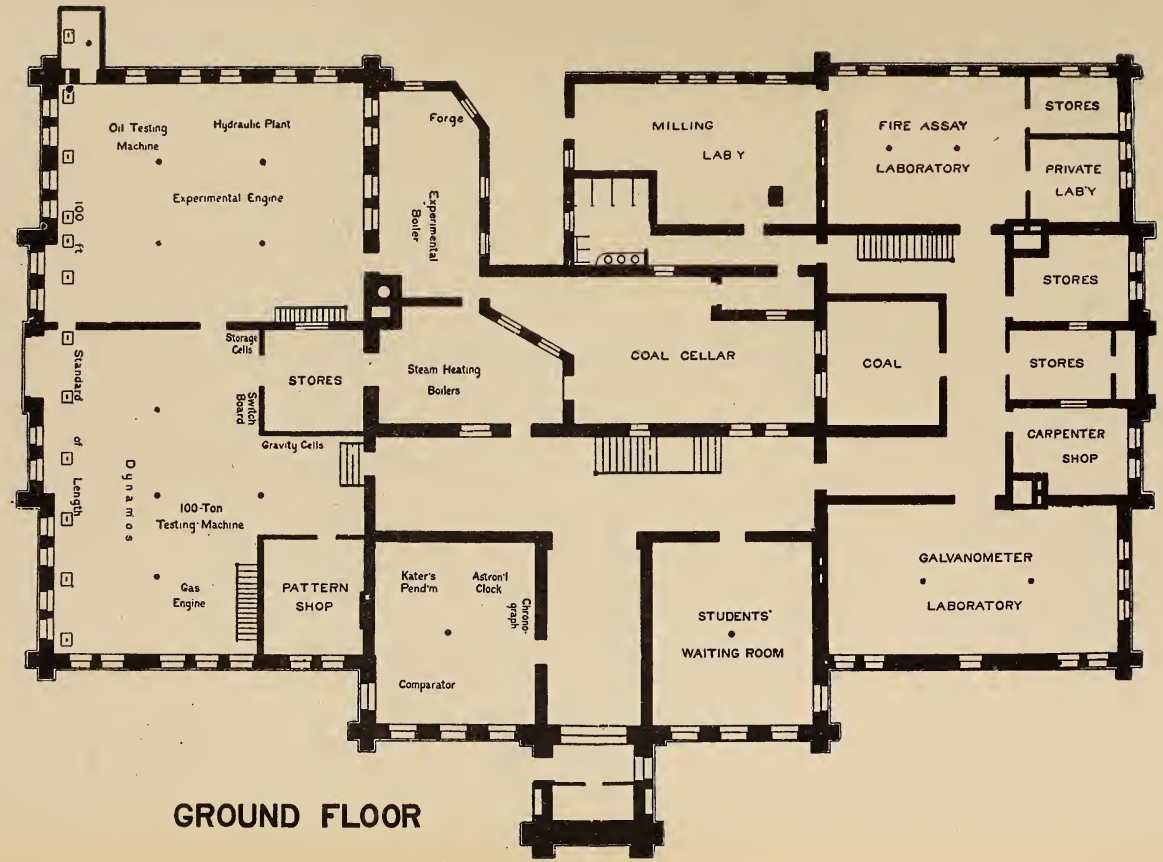
9. Meeting of Council.
9. Lectures and Practical Work close.
16. Good-Friday. Bdg. closed
17. **Annual Examinations** begin.

MAY.

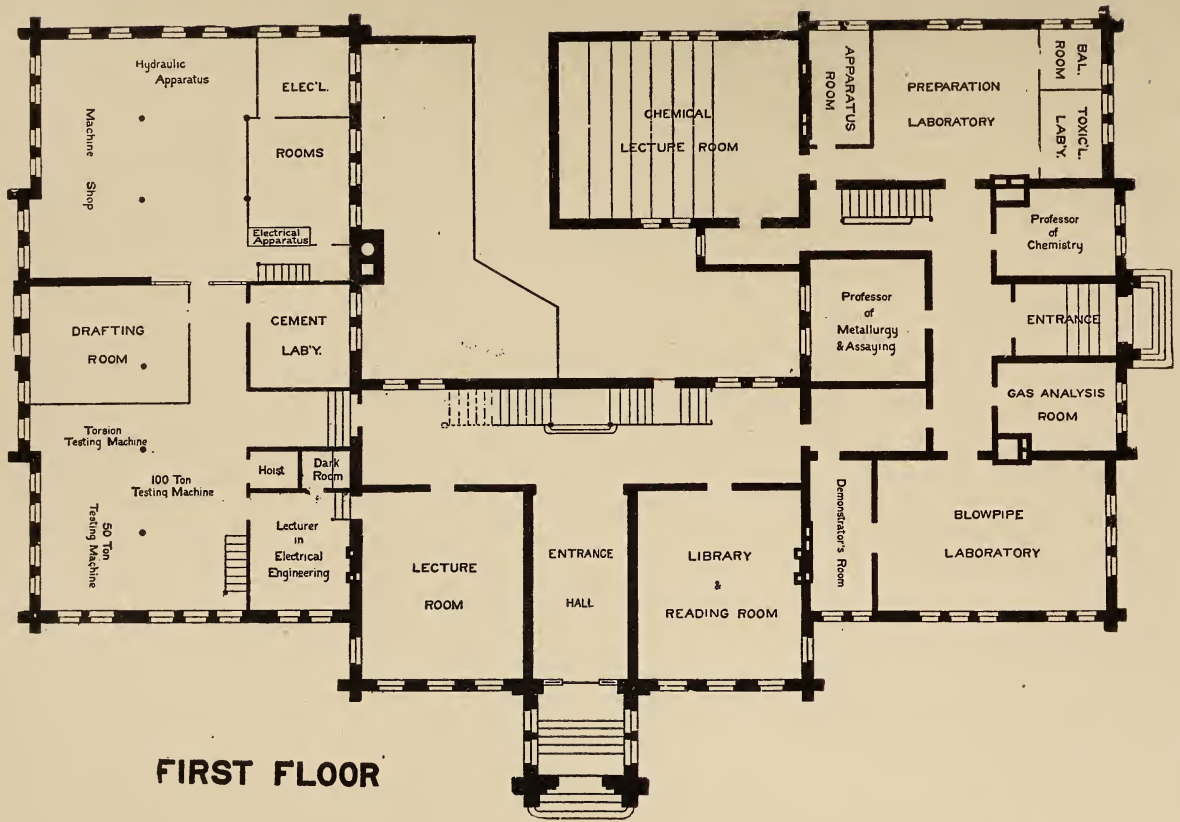
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	..	..	..	..	..

1. **SECOND TERM** ends.
11. Examinations for B.A.Sc. begin.

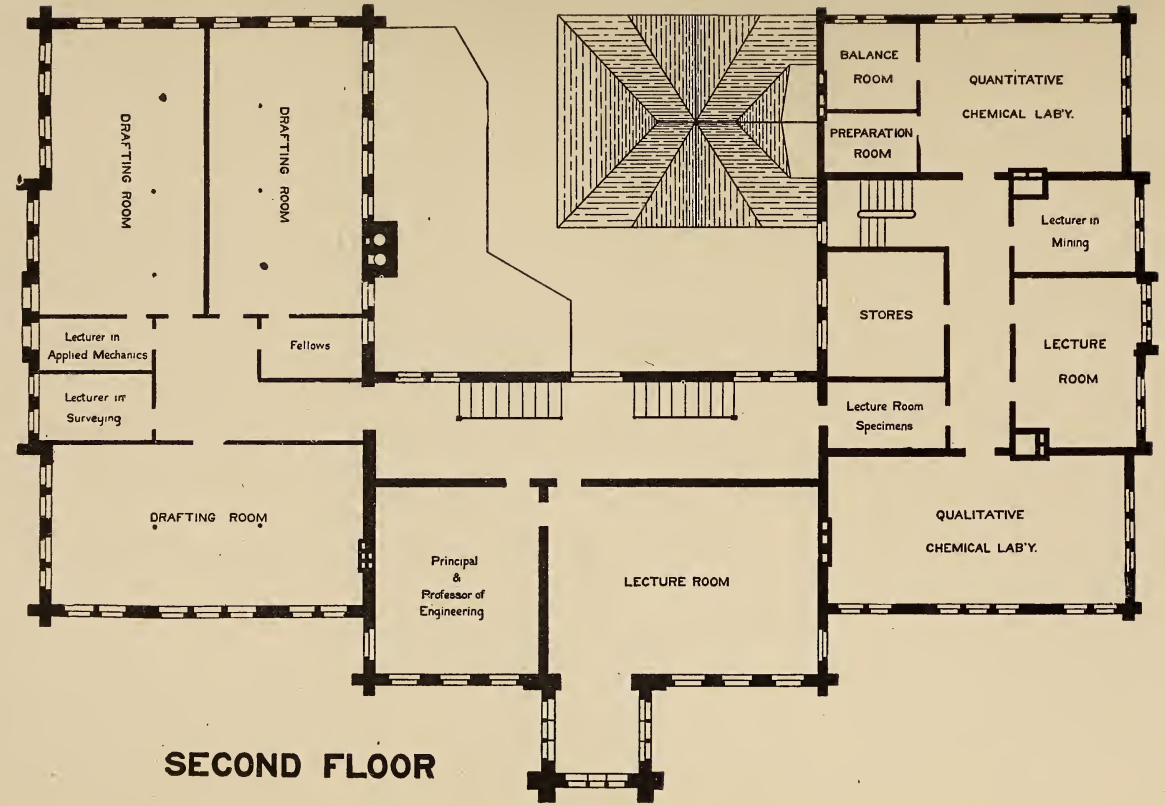
Black figures denote meetings of the Engineering Society.



GROUND FLOOR


Hydraulic Apparatus
Machine Shop
ELEC'L. ROOMS
Electrical Apparatus
DRAFTING ROOM
CEMENT LAB'Y.
Torsion Testing Machine
100 Ton Testing Machine
50 Ton Testing Machine
Hoist
Dark Room
Lecturer in Electrical Engineering
LECTURE ROOM
ENTRANCE HALL
LIBRARY & READING ROOM
CHEMICAL LECTURE ROOM
APPARATUS ROOM
PREPARATION LABORATORY
BAL. ROOM
TOXIC'L. LAB'Y.
Professor of Chemistry
ENTRANCE
Professor of Metallurgy & Assaying
GAS ANALYSIS ROOM
Demonstrator's Room
BLOWPIPE LABORATORY

FIRST FLOOR



SECOND FLOOR

ASSEMBLY HALL
MUSEUM
LECTURE ROOM
MUSEUM
MUSEUM
LECTURE ROOM
DRAFTING ROOM
Lecturer in Architecture

THIRD FLOOR

TIME TABLE—FIRST YEAR—SESSION 1896-97.

	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	
9-10	* Analytical Geometry, 1, 2, 3, 4 Chemical Lab'y, 5	* Euclid.	* Trigonometry.	* Algebra.	* Trigonometry.	9-10
10-11	* Elect'y & Magn'm 3, 5 (*a*) Drawing, 1, 2, 4 do 3, 5 (*b*)	Statics, 1, 2, 3, 4 do 5 (*a*) Drawing, 5 (*b*)	* Acoustics, 4 (*a*) Electricity, 3, 5 (*b*) Drawing, 1, 2 do 3, 5 (*a*) do 4 (*b*)	Statics, 1, 2, 3, 4 do 5 (*a*) Drawing, 5 (*b*)	* Elect'y & Magn'm, 3, 5 (*a*) Electricity, 3, 5 (*b*) History of Arch'e, 4 Drawing, 1, 2	10-11
11-12	Drawing, 1, 2, 3, 4 Chemical Lab'y, 5	Chemistry.	Chemistry.	Chemistry.	Pen and Ink 4 Drawing, 1, 2, 3, 5	11-12
12-1	Drawing, 1, 2, 3, 4 Chemical Lab'y, 5	Dynamics.	Descriptive Geometry.	Surveying, 1, 2, 3, 4 Drawing, 5	Drawing.	12 1
1-2						1-2
2-3	Chemical Lab'y.	* Physical Lab'y 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	2-3
3-4	Chemical Lab'y, 3, 5 Drawing, 1, 2, 4	* Physical Lab'y, 5, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	3-4
4-5	Chemical Lab'y, 3, 5 Drawing, 1, 2 History of Arch'e 4	* Physical Lab'y 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y 5 (b) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 4 (*b*) do 3	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5. Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments, In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—SECOND YEAR—SESSION 1896-97.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	
9-10	Rigid Dynamics, 1, 2, 3 History of Arch'e, 4	Surveying (Lect.) 1, 2, 4 Electricity, 3	* Calculus, 1, 2, 3, 4	* Astronomy, 1 Lithology, 2 Electricity 3 Drawing 4	* Calculus, 1, 2, 3, 4	9-10
10-11	* Optics, (*b*) Spherical Trig'y, 1, 2, 3 (*a*) Drawing, 4 (*a*)	* Hydrostatics, (*b*) * Heat, 5 (*b*) Metallurgy (*a*)	Descriptive Geo. 1,2,3,4	* Hydrostatics, (*b*) * Heat 5 (*b*) Metallurgy, (*a*)	* Optics, (*b*) Spherical Trig'y, 1, 2, 3 (*a*) Drawing 4 (*a*)	10-11
11-12	* Inorganic Chem'y, 5 Strength of Materials, 1, 2, 3, 4	Chemical Lab'y. Drawing.	Mineralogy and Geology, 1, 2, 4, 5 Theory of Mech'ism, 3	Drawing, 1, 2, 4 Electrical Lab'y, 3	* Inorganic Chem'y, 5 Pen and Ink, 4 Drawing, 1, 2, 3	11-12
12-1	Mineralogy and Geology, 1, 2, 3, 4 Theory of Mech'ism, 3	Chemical Lab'y. Drawing.	Strength of Materials, 1, 2, 3, 4	Drawing, 1, 2, 4 Electrical Lab'y, 3	Drawing, 1, 2, 3, 4	12-1
1-2						1-2
2-3	Mineralogical Lab'y, 1,2 Electrical Lab'y 3 Drawing 4	Applied Chemistry.	* Physical Lab'y 3, 5 (*a*) Orders of Arch'e 4 Drawing, 1, 2 do 3 (*b*)	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, (*b*) Field Work, 1, 2, 4 (*a*) Drawing (*b*)	2-3
3-4	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2. 4 (*a*) Drawing, 3	* Physical Lab'y 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing 3	* Physical Lab'y 3, 5 (*a*) Chemical Lab'y, (*b*) Field Work, 1, 2, 4 (*a*) Drawing, (*b*)	3-4
4-5	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, (*b*) Field Work, 1, 2, 4 (*a*) Drawing, (*b*) History of Ornament, 4	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—THIRD YEAR—SESSION 1896-97.

	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	
9-10	* Biology, 5 Thermodynamics, 1, 2, 3 Drawing 4	Hydraulics, 1, 2, 3, 4	* Biology, 5 Thermodynamics, 1,2,3 History of Arch'e 4	Hydraulics, 1, 2, 3, 4	* Biology, 5 Compound Strees, 1,3,4 Mining and Ore Dressing, 2	9-10
10-11	Drawing, 1, 2, 3, 4	Astronomy and Geodesy, 1 Machine Design, 3 Drawing, 4 Ore Deposits, 2 (*a*) Chemical Lab'y 2 (*b*)	Mineralogical Lab'y 1, 2, 5 (*a*) Assaying, 2 (*b*) Drawing 3, 4 do 1 (*b*)	Astronomy and Geodesy, 1 Machine Design, 3 Drawing 4 Ore Deposits, 2 (*a*) Chemical Lab'y, 2 (*b*)	Drawing, 1, 2, 3, 4	10-11
11-12	Drawing, 1, 2, 3 History of Arch'e, 4	Constructive Design, 1, 4 do 2, 3 (*a*) Drawing 3 (*b*) Chemical Lab'y 2 (*b*)	Mineralogical Lab'y, 1, 2, 5 (*a*) Assaying 2 (*b*) Drawing, 3, 4 do 1 (*b*)	Constructive Design, 1, 4 do 2, 3 (*a*) Drawing 3 (*b*) Chemical Lab'y 2 (*b*)	Drawing, 1, 2, 3, 4 Mechanics of Machinery, 3	11-12
12-1	Applied Chemistry.	Minerology and Geology, 1, 2, 4, 5 Drawing, 3	Mineral'l Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Principles of Dec'n, 4 Drawing, 3 do 1 (*b*)	Mineralogy and Geology, 1, 2, 4, 5 Electricity, 3	Applied Chemistry.	12-1
1-2						
2-3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do 3 (*b*) Plumbing, Heating, and Ventilation, 4	Field Work, 1, 2, 4 (*a*) Electrical Lab'y 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	Descriptive Geometry, 1, 2, 3, 4 (*a*) Theory of Least Squares, 1, 3 (*b*) Chemistry, 2 (*b*)	* Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 4 (*b*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y 2 (*b*) Drawing 3 (*b*)	2-3
3-4	* Physical Lab'y 3, 5 (*a*) * Organic Chemistry, 5 Drawing, 1, 2, 4 do 3 (b)	* Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 3 do 4 (*a*) Chemistry 2 Pen and Ink, 4 (*b*)	* Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 4 (*b*) Chemical Lab'y, 2 (*b*) * Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	3-4
4-5	* Physical Lab'y 3, 5 (*a*) Surveying (Lect.) 1, 2, 4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 3, 4 Chemistry, 2	Field Work, 1, 2, 4 (*a*) Electrical Lab'y 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	* Physical Lab'y, 3, 5 (*a*) do 1, 4 (*b*) Chemical Lab'y, 2 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	4-5

1, Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the depatrments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—FOURTH OR POST-GRADUATE YEAR.

There is no regular time table for the work of this year. The time of the students is spent almost wholly in the engineering, chemical, and assaying laboratories. The hours are from 9 a.m. to 5 p.m. every working day during the session. Lectures are given at such intervals as suit the laboratory work.

FACULTY OF THE SCHOOL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., Principal.

MEMBERS OF THE COUNCIL.

J. GALBRAITH, M.A., M. Can. Soc. C.E..*Professor of Engineering (Chairman).*
W. HODGSON ELLIS, M.A., M.B.....*Professor of Applied Chemistry.*
A. P. COLEMAN, M.A., Ph.D.....*Professor of Assaying and Metallurgy*
L. B. STEWART, P.L.S, D.T.S.....*Lecturer in Surveying (Secretary).*
C. H. C. WRIGHT, B.A.Sc.....*Lecturer in Architecture.*
T. R. ROSEBRUGH, M.A., Grad. S.P.S..*Lecturer in Electrical Engineering.*
J. A. DUFF, B.A., Grad. S.P.S.....*Lecturer in Applied Mechanics.*
G. R. MICKLE, B.A., Grad. S.P.S.....*Lecturer in Mining.*

ASSISTANT INSTRUCTORS.

W. E. BOUSTEAD, B.A.Sc.....*Acting Demonstrator in Metallurgy and Assaying.*
J. KEELE, B.A.Sc.....*Fellow in Civil Engineering.*
W. MINTY, B.A.Sc.....*Fellow in Mechanical Engineering*
A. T. LAING, B.A.Sc.....*Fellow in Surveying.*
A. E. BLACKWOOD, Grad. S.P.S.....*Fellow in Electrical Engineering.*
W. LAWSON, B.A.Sc.....*Fellow in Analytical and Applied Chemistry.*

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

JAMES LOUDON, M.A., LL.D ..... *President and Professor of Physics.*
R. RAMSAY WRIGHT, M.A., B.Sc .....*Professor of Biology.*
W. H. PIKE, M.A., Ph.D.....*Professor of Chemistry.*
ALFRED BAKER, M.A.....*Professor of Mathematics.*
A. B. MACALLUM, B.A., M.B., Ph.D....*Professor of Physiology.*
W. J. LOUDON, B.A.....*Demonstrator in Physics.*
C. A. CHANT, B.A.....*Lecturer in Physics.*
J. C. McLENNAN, B.A.....*Assistant Demonstrator in Physics.*
ALFRED T. DeLURY, B.A..... *Lecturer in Mathematics.*
W. L. MILLER, B.A., Ph.D.....*Demonstrator in Chemistry.*
W. J. RUSK, B.A .....*Fellow in Mathematics.*

For information further than that contained in the Calendar, applications may be made to the Secretary, L. B. STEWART.

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO.

CALENDAR FOR THE SESSION 1896-7.

In the Session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction, in each of which Diplomas are granted, viz. :—

1. Civil Engineering (including Sanitary Engineering).
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also such a training as may make him immediately useful when he enters into active professional work.

Diploma.

The regular course in each department is of three years' duration, and leads to the Diploma of the School. The instruction is given partly in the lecture rooms and partly in the drafting rooms, laboratories and field. A certain amount of work is laid out for the long vacation. The course of study in each department is general, and beyond the selection of his department the student has no opportunity to specialize.

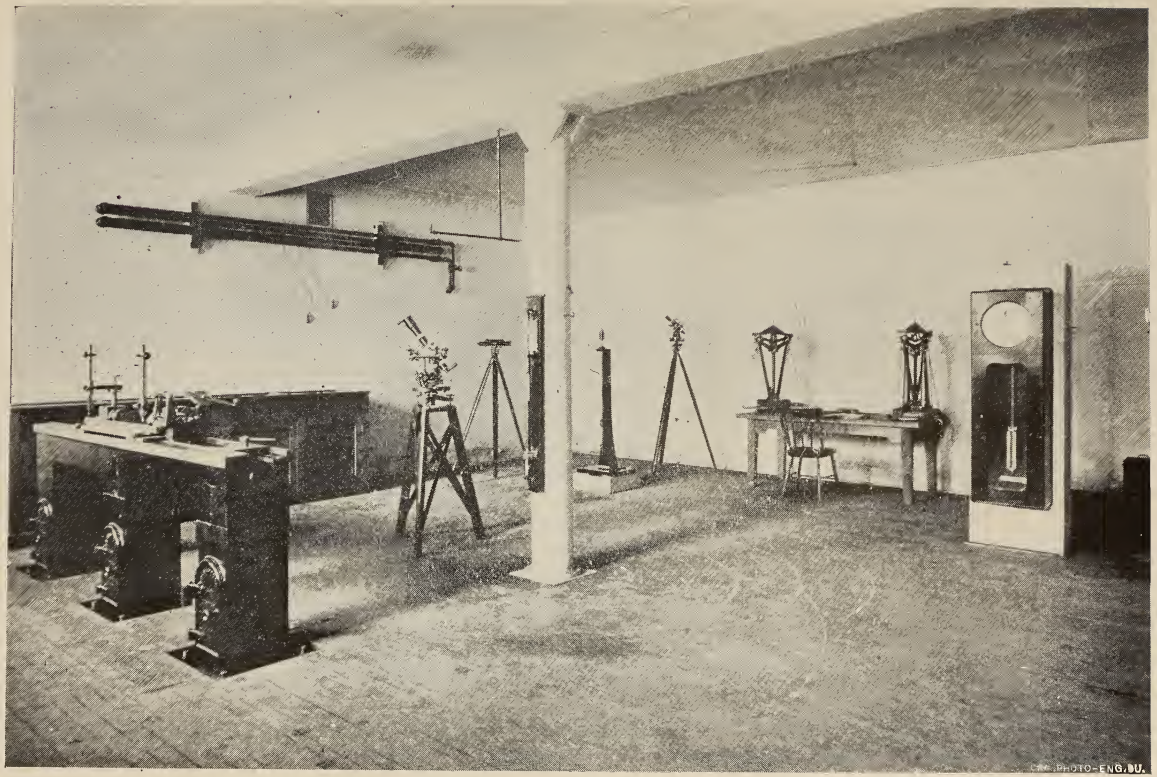
Degree of B. A. Sc.

After the general course is finished the Diploma of the School is granted and the student is at liberty either to enter the active life of his profession or to spend another year in special work. This year is called the fourth, or post-graduate, year. Students electing to proceed with their studies are allowed to select two subjects from an approved list, and are required to confine their whole attention to these subjects during the fourth year. The subjects on this list are such as require a large amount of time to be devoted to laboratory and other practical work. The advanced theoretical instruction is given either at the beginning or end of the working-day, in order not to break up the time allotted to practical work. During this year the student is required to prepare a Thesis on some subject connected with his work. The practical examinations are held by the School, while the written examinations and the examination of the Theses are held by the University. After complying with all requirements, the candidate receives from the University the degree of Bachelor of Applied Science (B. A. Sc.).

Professional Degrees.

Bachelors of Applied Science may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C. E.), Mining Engineer (M. E.), Mechanical Engineer (M. E.), or Electrical Engineer (E. E.), as the case may be, subject to the rules and regulations established by the University.

GALVANOMETER LABORATORY.



CLOCK ROOM.

REGULATIONS

RESPECTING THE

SCHOOL OF PRACTICAL SCIENCE.

Approved by His Honor the Lieutenant-Governor in Council the 3rd day of April, 1894.

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be chairman) consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall consist of two Terms, the First Term extending from 1st October to 23rd December, and the Second Term from 8th January to 1st May.

3. A Diploma shall be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments :

   (1) Civil Engineering (including Sanitary Engineering).
   (2) Mining Engineering.
   (3) Mechanical and Electrical Engineering.
   (4) Architecture.
   (5) Analytical and Applied Chemistry.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. Students may enter the Regular Course in any one of the above Departments either (*a*) by presenting certificates of having passed the Matriculation Examination in any University in Her Majesty's Dominions, or in all the subjects of such Matriculation Examina-

tion except Greek and Latin, or the High School Leaving Examination of the Province of Ontario, or (*b*) by presenting certificates of having had at least one year's experience in some recognized engineering, architectural or manufacturing work or business, and passing an examination in the following subjects :

Arithmetic.—Fundamental rules, metric system, fractions, decimals, powers, square root, mensuration, percentage, interest.

Algebra.—Elementary rules, easy factoring, highest common measure, lowest common multiple, square root, fractions, ratio, simple equations of one, two or three unknown quantities, indices, surds, quadratic equations of one or two unknown quantities.

Euclid.—Books I., II., and III. ; deductions.

English.—Dictation, composition.

6. The Council shall have the power of dealing with special cases, provided the candidates are sufficiently prepared to take their places in the classes.

7. Special students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper.

8. Certificates of attendence and standing may be given upon due examination to special students, and such students shall not be required to pass an entrance examination.

9. At the end of the Academic Year examinations will be held in the different subjects taught. Candidates for Diplomas and Certificates are required to enter for these.

10. All regular students shall be in attendance at the school during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

11. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council

ADMISSION.

The conditions of admission for regular and special students are stated in clauses 5, 6, 7 and 8 of the order in Council, pp. 25 and 26.

For information regarding the conditions for Matriculation in the Universities, application must be made to the Registrars of these Institutions.

Information respecting the High School Leaving Examination may be obtained from the Education Department, Toronto, or from any Principal of a High School or Collegiate Institute.

Students intending to write at the High School Leaving Examination for the purpose of entering the School of Practical Science may do so without having previously passed the Primary Examination. Their papers must be endorsed "For admission to School of Practical Science."

The only examination held in the School of Practical Science for the purpose of testing qualifications for admission is that mentioned in clause 5 (*b*) order in Council, p. 26.

This examination will begin at 9 a.m. Monday, September 28th, 1896.

Candidates are required to give the Secretary at least two weeks' notice in writing of their intention to take this examination.

FORM OF DIPLOMA

THE

SCHOOL OF PRACTICAL SCIENCE

PROVINCE OF ONTARIO.

ESTABLISHED 1878.)

THIS IS TO CERTIFY *that*

.....

of the.....*in the*.....

.....*has completed the Regular Course of this School for the Diploma in the* ..... *extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, viz. :*

.....

.....

.....

WHEREFORE *the said*.....

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

IN WITNESS *whereof we have signed this Diploma at Toronto, in the Province of Ontario, this*.....*day of*.....

.....*One thousand eight hundred and*.....

and have caused the seal of this School to be hereunto affixed.

[L.S.]

.....*Chairman.*

.....*Secretary.*

REGULAR COURSES FOR THE DIPLOMA.

See regulations, pp. 25 and 26.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Sanitary Engineering).
(2) Mining Engineering.
(3) Mechanical and Electrical Engineering.
(4) Architecture.
(5) Analytical and Applied Chemistry.

SESSIONAL FEES, DUES AND DEPOSITS.

These are payable in two instalments, one in each term.

A discount of two dollars will be made on each instalment if paid before the end of the first calendar month of the term in which it is due.

The following table shows the amounts payable in the Regular Courses :

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	c.
I.	Payable in First Term—					
	Sessional Fees	22 00	22 00	22 00	22 00	22 00
	Dues—					
	Physical Laboratory ...	.....	.....	1 00	.....	1 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory ...	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	.....	.....	.....	.....	.....
		28 00	28 00	29 00	28 00	29 00
	Payable in Second Term —					
	Sessional Fees.....	22 00	22 00	22 00	22 00	22 00
	Total	50 00	50 00	51 00	50 00	51 00

SESSIONAL FEES, DUES AND DEPOSITS.—*Concluded.*

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	$ c.
II.	Payable in First Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Dues—					
	Physical Laboratory	1 50	1 50	1 50	1 00	1 50
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	3 00	3 00	.....	.....	3 00
		37 50	37 50	34 50	34 00	37 50
	Payable in Second Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Total	64 50	64 50	61 50	61 00	64 50
III.	Payable in First Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Dues—					
	Physical Laboratory	1 00	.....	3 00	2 00	3 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	.....	.....	.....	.....	3 00
	Mineralogical Laboratory	3 00	3 00	.....	.....	.....
		39 00	38 00	38 00	37 00	41 00
	Payable in Second Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Total	71 00	70 00	70 00	69 00	73 00

The total expense of a regular three years' course in any department is about $280, which amount includes books, instruments and materials as well as the fees, etc., stated in above table.

Fourth or Post-Graduate Year.—The fees, etc., in this year are as follows:

Payable in First Term—	
Sessional Fees	$30 00
Dues, Library	1 00
Deposits, General	2 00
Payable in Second Term—	
Sessional Fees	29 00
Total	$62 00

Special Students.—The fees payable by special students depend upon the nature and amount of work taken. All special students are required to pay the library fee, $1, the general deposit, $2, and the deposits and dues of the laboratories in which they work.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

Special Certificates.—Certificates will be granted to special students only in cases in which application has been made to the Council at the beginning of the session and conditions of award arranged.

FELLOWSHIPS.

The following fellowships have been established, open to graduates of the school: Civil Engineering, Mechanical Engineering, Electrical Engineering, Surveying, Analytical and Applied Chemistry.

Each fellowship is of the value of $500 per annum.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

REGULATIONS RESPECTING EXAMINATIONS.

Candidates are required to send to the Secretary at least three weeks before the commencement of the Annual Examinations in April, and the Supplemental Examinations in October, notice in writing of their intention to take such examinations.

This regulation applies to all regular students and to such special students as may be candidates for certificates.

No candidate will be allowed his examination who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

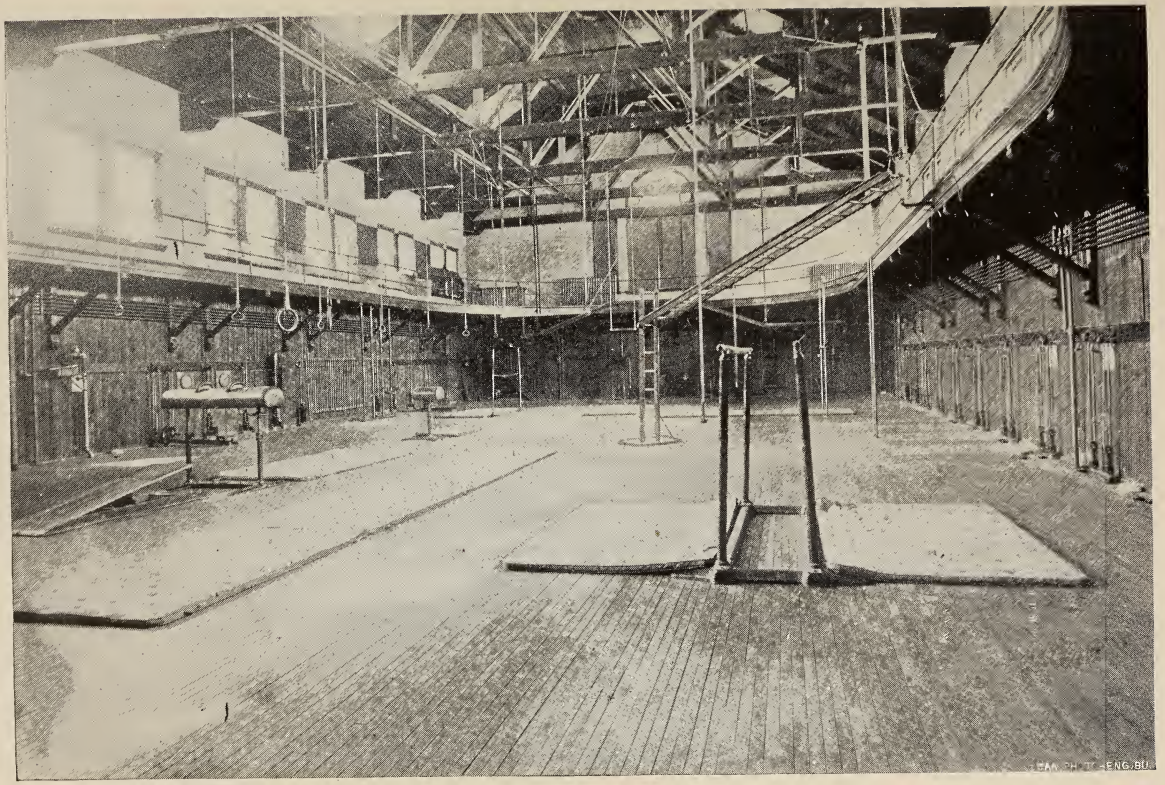
The minimum percentage of marks required to pass in the practical work connected with any subject shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respective Years and Departments :

Department.	Year.	Applied Mechanics.	Descriptive Geometry.	Surveying.	Architecture.
Civil Engineering	I.	8	7	6	.....
	II.	6	12	4	.....
	III.	8	11	4	.....
Mining Engineering	I.	8	7	6	.....
	II.	5	9	4	
	III.	4	8	4	.....
Mechanical and Electrical Engineering	I.	8	7		.....
	II.	12	7	.....	.....
	III.	12	10	.....	.....
Architecture	I.	8	7	2	7
	II.	5	9	.....	9
	III.	6	8	.....	10
Analytical and Applied Chemistry	I.	4	7	.....	.....

ARCHITECTURAL LECTURE ROOM.



GYMNASIUM.

The above number of drawings will include only such as shall be specially prescribed for the purpose.

These drawings will be prescribed as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the drawings referred to in the preceding table must be made, together with as many others as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum number of drawings shall be twenty-five and the maximum number thirty-five, except in the Department of Analytical and Applied Chemistry, in which the numbers shall be fifteen and twenty-five respectively.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The drawings must be made on paper 15 x 22 inches, unless otherwise prescribed.

At the end of each term the drawings must be neatly bound together between covers of approved pattern before they are finally examined, and the student's name, together with his year, term and date, neatly printed on said cover.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the School without permission.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

No field notes will be counted which have not been taken in the field, and during the hours allotted to such work.

The penalties for the infringement of the above two rules will be determined in each case by the Council.

Vacation Work.

Vacation work must be handed in on or before October 5th, otherwise it will not be counted.

Vacation notes must be on construction only, and consist of not less than twenty, nor more than thirty pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap, and consist of not less than twenty, nor more than thirty pages.

The minimum percentage of marks required for practical work must be made in the case of vacation notes and theses.

No notes, whether taken during the session or the vacation, will be counted unless made in the standard note books of the School.

Theses must be accompanied by carefully made drawings and illustrations separated from the text, and be bound between flat covers.

The sketches for the second year thesis in the Architectural Course are to be made on one side of the sheet of a sketch book and mounted on cardboard or paper 15 x 22 inches.

The Architectural students are advised to spend the vacation in architects' offices.

Supplemental Examinations, Etc.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examinations and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and to do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject, he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations in subjects taught by the staff of the school will begin on the second day of the session. In other subjects they will be held at the time of the annual examinations.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year or in graduating will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis indicate ignorance of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between 9 a.m. and 5 p.m. at the work laid down in the time table.

No exemption from any of the foregoing regulations will be granted, unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

PRIZES.

Through the liberality of Mr. D. B. Dick, Architect, Toronto, a prize of $10 in books will be open annually for competition in the first year of the Architectural Department.

HONORS.

Honors will be granted in each department to students who pass in all the subjects and obtain at least 66 per cent. of the total number of marks allotted to the department at the annual examinations.

Papers read before the Engineering Society will be considered in granting Honors.

The Honor list will be arranged alphabetically.

REGULAR EXAMINATIONS.

(Approximate List.)

I. YEAR.

Examinations held at end of session.

Algebra.
Euclid.
Plane Trigonometry.
Analytical Geometry...1, 2, 3, 4.
History of Architecture.....4.
Magnetism and Electricity...3, 5.
Acoustics .....4.
Statics.
Dynamics.
Descriptive Geometry.
Surveying .....1, 2, 3, 4.
Chemistry, Elementary.
Electricity .....3, 5.

Examinations held during the session.

Drawings.
Field Notes .....1, 2, 4.
Construction Notes.....1, 2, 3, 4.
Architectural Sketches .....4.
Experimental Physics.....3, 5.
Practical Chemistry.
French and German.....5.

II. YEAR.

Examinations held at end of session.

Calculus .....1, 2, 3, 4.
Astronomy .....1.
Optics.
Hydrostatics.
Heat .....5.
History of Architecture.....4.
Orders of Architecture .....4.
History of Ornament.....4.
Chemistry, Inorganic & Physical, 5.
Chemistry, Applied.
Strength of Materials ...1, 2, 3, 4.
Rigid Dynamics .....1, 2, 3.
Theory of Mechanism.....3.
Descriptive Geometry...1, 2, 3, 4.
Surveying.....1, 2, 4.
Spherical Trigonometry....1, 2, 3.
Mineralogy and Geology. 1, 2, 4, 5.
Lithology .....2.
Electricity .....3, 5.
Metallurgy.

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

Examinations held during the session.

Drawing .....1, 2, 3, 4.
Field Notes..... .....1, 2.
Construction Notes .....1, 2, 3, 4.
Architectural Sketches .....4.
Experimental Physics.
Electricity, Practical .....3.
Thesis (at beginning of session).
Chemistry, Practical.
Mineralogy, Practical.....1, 2, 5.
French and German.....5.

III. YEAR.

Examinations held at end of session.

Magnetism and Electricity...3, 5.
History of Architecture.....4.
History of Ornament.....4.
Principles of Decoration.....4.
Method of Least Squares....1, 3.
Chemistry, Inorganic & Organic, 5.
Chemistry, Applied.
Mineralogy and Geology, 1, 2, 4, 5.
Sanitary Plumbing, Heating and Ventilation .. ..4.
Theory of Compound Stress, 1, 3, 4.
Theory of Construction..1, 2, 3, 4.
Mechanics of Machinery .....3.
Machine Design.....3.
Hydraulics.....1, 2, 3, 4.
Thermodynamics.....1, 2, 3.
Descriptive Geometry...1, 2, 3, 4.
Practical Astronomy & Geodesy, 1.
Surveying and Levelling...1, 2, 4.
Metallurgy.....2, 3, 5.
Mining and Ore Dressing.....2.
Ore Deposits .....2.

Examinations held during the session.

Drawings .....1, 2, 3, 4.
Field Notes.....1, 2.
Construction Notes.....1, 2, 3, 4.
Architectural Sketches .....4.
Experimental Physics ...1, 3, 4, 5.
Electricity, Practical ... .3.
Thesis (at beginning of session).
Chemistry, Practical .....2, 5.
Mineralogy, Determinative.1, 2, 5.
Assaying.....2, 5.

1. Civil Engineering.
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

I. DEPARTMENT OF CIVIL ENGINEERING.

(Including Sanitary Engineering.)

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Sanitary Engineers).

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane-sided solids, Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

CHEMISTRY.

Elementary Chemistry, with Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

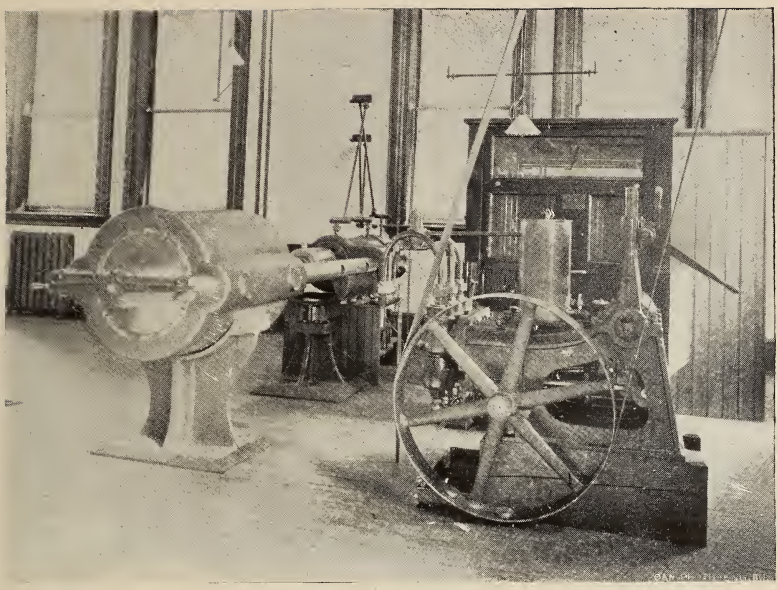
SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

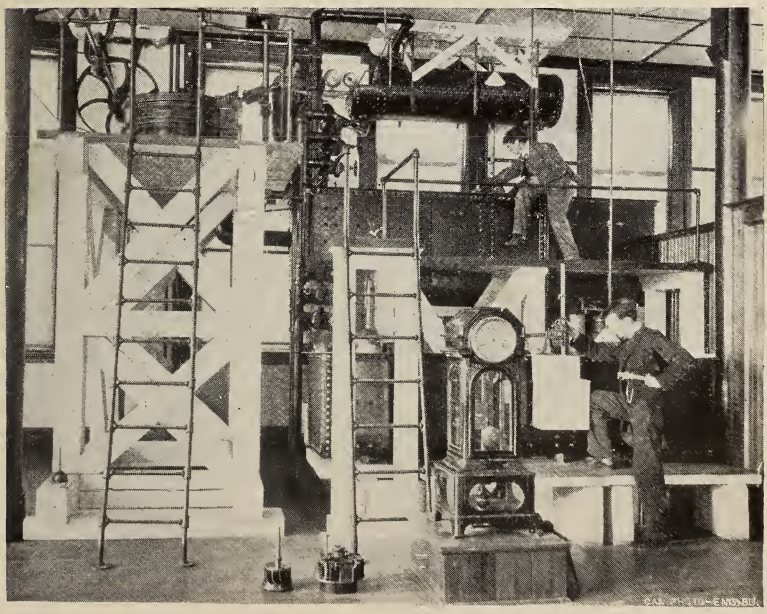
II. YEAR.

MATHEMATICS.

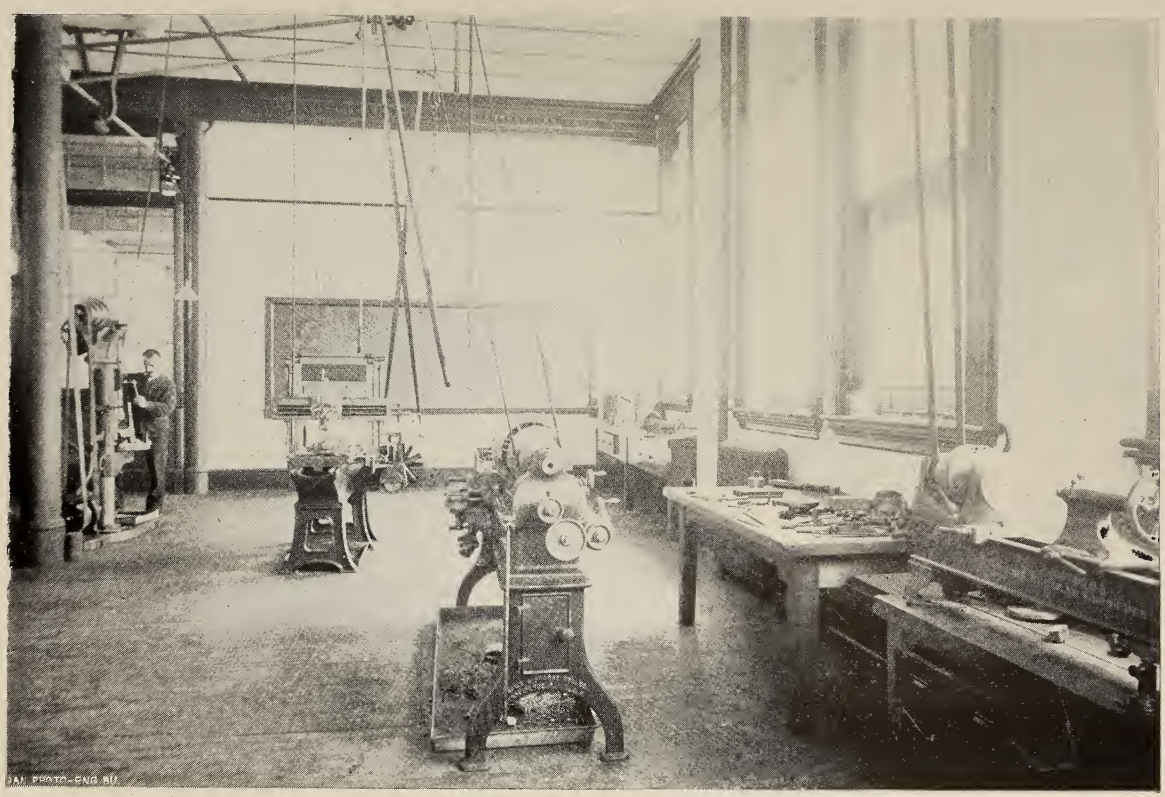
Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astronomy.



EMERY TESTING MACHINE.



HYDRAULIC PLANT.



MACHINE SHOP.

DRAWING.

Subjects of First year continued.

Coloring and shading applied in both topographical and construction drawing.

Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.

Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry with special reference to industrial applications.

Practical Chemistry.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied.)

Strength and Elasticity of Materials.

Experimental work in Engineering Laboratory.

Transit-Theodolite Surveying.

Levelling.

Railway Location, curves, etc.

Hydrographic Surveying.

MINERALOGY AND GEOLOGY.

Elements of these Sciences.

Blowpipe practice.

Determination of minerals.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.

Optics.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.

Calculation of focal lengths.

The prism and spectroscope.

Goniometer and heliostat.

VACATION WORK.

See pages 38 and 87.

III YEAR.

Drawing.

Subjects of previous years continued.
Descriptive Geometry.
- Shades and Shadows.
- Stone cutting.
- Perspective Projection.

Original Designs—Bridges, Roofs, Floors, Arches, etc.

Chemistry (Applied).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

Engineering and Surveying.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
- Bridges, Roofs, Floors.
- Arches, Retaining Walls.
- Foundations, etc.

Thermodynamics and Theory of the Steam Engine.
Hydraulics, Sewerage, Water Supply.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross sections, Field work and Plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a sphere).
Practical Astronomy (treated in the manner required for the O.L.S. and D.L.S. Examinations).
Least Squares.

Mineralogy and Geology.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

Experimental Physics.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

Vacation Work.

See pages 38 and 87.

II. DEPARTMENT OF MINING ENGINEERING.

This Department is designed to afford the necessary preliminary training to students intending to become Mining Engineers.

1. YEAR.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

Drawing.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane-sided solids. Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

Chemistry.

Elementary Chemistry, with Laboratory Practice.

Mechanics.

Statics and Dynamics (with special reference to structures and machines).

Surveying.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

II. YEAR.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.

Drawing.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

Chemistry.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

Engineering and Surveying.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway location, curves, etc.
Mining Surveying.

Mineralogy and Geology.

Elements of these Sciences.
Blowpipe Practice.
Determination of Minerals.
Lithology.

Metallurgy.

Iron and Steel.

Physics.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 38 and 87.

III YEAR.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.
Laboratory work in Qualitative and Quantitive Analysis.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Thermodynamics and Theory of Steam Engine.
Hydraulics.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, cross-sections, field work and plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.

Mineralogy and Geology.

Economic Geology.
Palæontology.
Ore Deposits.
Blowpipe Analysis and Determinative Mineralogy.
Metallurgy of Gold, Silver, Nickel, Copper, etc.
Mining and Ore Dressing.
Assaying.

Vacation Work.

See pages 38 and 87.

III. DEPARTMENT OF MECHANICAL AND ELECTRICAL ENGINEERING.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

I. YEAR.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

Drawing.

Copying from the flat. Lettering.
Graphics.
Descriptive Geometry in its application to plane-sided solids.
Orthographic (including Isometric) and Oblique Projection.

Chemistry.

Elementary Chemistry with Laboratory Practice.

Mechanics.

Statics and Dynamics (with special reference to structures and machines).

Surveying.

(Lectures only.) Applications of Trigonometry and Principles of Measurement.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

DRAWING.

Subjects of first year continued.
Coloring and shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

ENGINEERING.

Statics and Dynamics (pure and applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials and Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

Experimental Physics.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

Electrical Laboratory.

Vacation Work.

See pages 38 and 87.

III. YEAR.

Drawing.

Subjects of previous years continued.
Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.

Chemistry (Applied).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

Engineering.

Subjects of previous years continued.
Applied Mechanics:
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.
Electricity:
Dynamos and motors.
Application of principles to practical problems connected with the design, construction and testing of various prime motors and machines.
Experimental work in Engineering Laboratory.
Least Squares.

METALLURGY.

Gold, Silver, Nickel, Copper, Lead.

EXPERIMENTAL PHYSICS.

Terrestrial Magnetism.

ELECTRICAL LABORATORY.

ORIGINAL DESIGNS.

Engine and Machine Design.

VACATION WORK.

See pages 38 and 87.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical and Electrical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

IV. DEPARTMENT OF ARCHITECTURE.

This course is designed to afford the necessary preliminary training to students intending to become Architects.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Plane Analytical Geometry.

DRAWING.

Copying from the flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.
Rendering in pencil and pen and ink.

CHEMISTRY.

Elementary Chemistry with Laboratory Practice.

MECHANICS.

Statics (with reference to structures).
Dynamics (preliminary to the study of hydraulics).

SURVEYING.

Principles, Chain Surveying, Mensuration.

PHYSICS.

Acoustics.

HISTORY OF ARCHITECTURE.

General introduction to subject.
Ancient Architecture.
Egyptian, Assyrian and Persian.

II. YEAR.

MATHEMATICS.

Differential and Integral Calculus.

DRAWING.

Instrumental Drawing, Drawing from the Cast, Sketching and Water Color, Pen and Ink.
Descriptive Geometry (curved surfaces).

CHEMISTRY.

Chemistry, with special reference to industrial applications.
Practical Chemistry.

MECHANICS.

Statics (pure and applied).
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory.

SURVEYING.

Use of transit and level.
Mensuration.

MINERALOGY AND GEOLOGY.

Elements.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light: Uses of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.
Acoustics: Laws of vibrating strings.
Determination of Pitch.
Velocity of Sound.
Electric Fork.
Chronograph.

HISTORY OF ARCHITECTURE.

Greek and Roman.
Romanesque and Byzantine.

ORDERS AND ELEMENTS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

Ancient.
Classic—Greek, Roman.

VACATION WORK.

See pages 38 and 87.

III. YEAR.

DRAWING.

Descriptive Geometry.
Shades and Shadows.
Stone cutting.
Perspective Projection.
Water Color sketching.
Original Designs—Floors, Trusses, Arches, etc.

CHEMISTRY (APPLIED).

Thermo-Chemistry.
Combustion.
Fuel.
Explosives.
Artificial Lighting.
Photography.

THEORY OF CONSTRUCTION.

Experimental work in Engineering Laboratory.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing, Ventilation and Heating.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

MINERALOGY AND GEOLOGY.

Economic Geology.

EXPERIMENTAL PHYSICS.

Heat : Specific Heat ; Latent Heat.
Expansion of Air ; Air Thermometer.

HISTORY OF ARCHITECTURE.

Gothic and Renaissance, with special reference to England.

HISTORY OF ORNAMENT.

Early Christian ; Gothic and Renaissance.

PRINCIPLES OF DECORATION.

VACATION WORK.

See pages 38 and 87.

V. DEPARTMENT OF ANALYTICAL AND APPLIED CHEMISTRY.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists or industrial chemists.

I. YEAR.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.

DRAWING.

Copying from the flat. Lettering.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.
Model Drawing.

CHEMISTRY.

Elementary Chemistry with Laboratory practice.

MECHANICS.

Statics and Dynamics.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

MODERN LANGUAGES.

French.
German.

II. YEAR.

CHEMISTRY.

Inorganic and Physical Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis.

Mineralogy and Geology.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

Metallurgy.

Iron and Steel.

Physics.

Hydrostatics.
Optics.
Heat.
Electricity.

Experimental Physics.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

Electrical Laboratory.

Modern Languages.

French.
German.

Vacation Work.

See pages 38 and 87.

III. YEAR.

Chemistry.

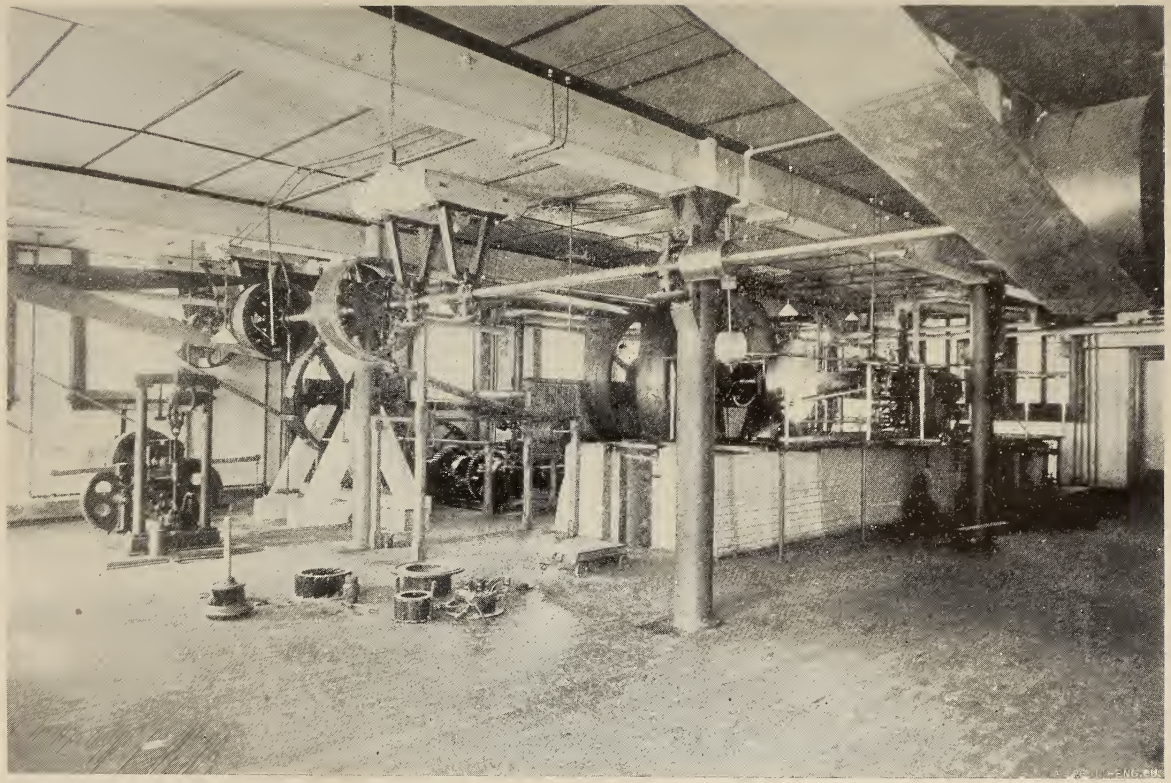
Organic Chemistry and Chemical Physics.
Applied Chemistry.
Laboratory work.

Mineralogy and Geology.

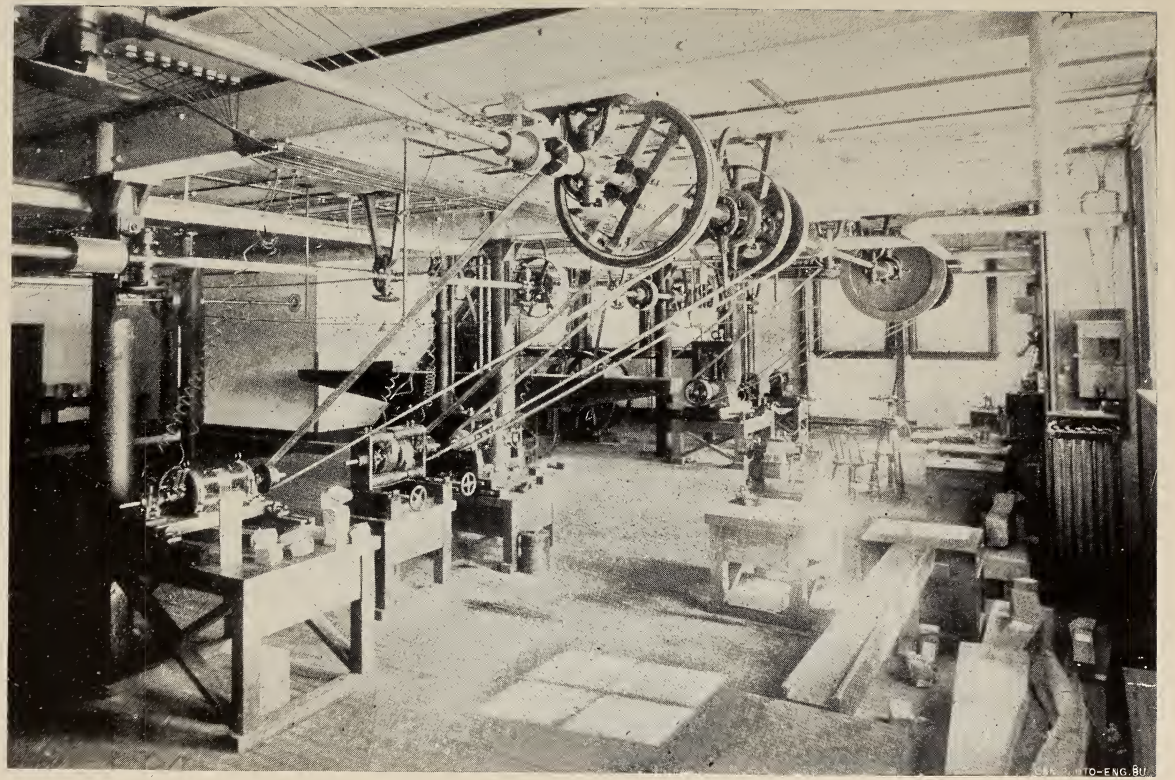
Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

Metallurgy.

Gold, Silver, Nickel, Copper, Lead.



EXPERIMENTAL ENGINE.



DYNAMO ROOM.

Experimental Physics.

Terrestrial Magnetism

Biology.

Vacation Work.

See pages 38 and 87.

THE FOURTH YEAR.

After the completion of the general three years' course in any department, students are recommended to take up the special work of the fourth year, leading to the degree of Bachelor of Applied Science, University of Toronto. It is only by so doing that full advantage can be taken of the splendid laboratory equipment of the school. The fourth year enables students to continue under certain restrictions the study of subjects in which they take special interest and is the means adopted in the School of Practical Science of affording them the advantage of optional and special studies.

To be admitted to the fourth year a candidate must be a graduate of the School of Practical Science or an undergraduate of the standing of the fourth year in the University of Toronto in the Honor Department of Chemistry and Mineralogy.

The subjects of study in the fourth year are arranged in the following groups and sub-divisions :

A. { Astronomy.
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

Each student will be required to confine his studies during the session to one of the above groups. He will not be allowed to take less than two nor more than three of the sub-divisions in any group.

The sub division "Inorganic and Organic Chemistry" will be obligatory on all students who select group C.

A student is liable to be called on to assist in any of the experimental and practical work in the group which he has selected, although it may not belong to his special subjects.

Candidates are required to notify the Secretary in writing of their intention to take the fourth year work at least one week before the opening of the session, and to inform him at the same time as to the subjects which they propose to take. These subjects will be submitted to the Council for approval at the beginning of the session, and no student will be permitted to take any subjects not so approved.

Undergraduates of the University of Toronto of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy may be admitted as students in the fourth year in the groups C. and D.

Candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested by their ability to translate extracts from scientific works or periodicals not previously specified.

Pass and Honors.

Total marks assigned to fourth year ..... 900.

Sub-divided as follows :—

Work (reckoned in hours)..... 540 marks.
Records (notes, drawings, etc) ..... 360 "

For Pass.

The minimum percentages are :

Work, 75 per cent..... .. 405 marks.
Records, 50 " ..... 180 "
And two-thirds of the total marks assigned .... 600 "

For Honors.

In deciding the allotment of honors the whole academic record of the candidate will be taken into consideration, but no honors will be granted unless the candidate shall have received a special recommendation from the member or members of Council under whose supervision his fourth year work has been done.

Honors granted will be mentioned in the certificate required under clause 2 of the statute of the University of Toronto respecting the degree of B.A.Sc.

The above certificate will not be granted to students who have been absent without leave of the Council from more than ten per cent. of the lectures and practical work of either term of the session.

Courses of reading will be indicated in connection with subjects of study.

The above regulations have been approved by the Senate of the University of Toronto in so far as they affect the degree of B.A.Sc.

DEGREE OF B.A.Sc.

Candidates who have fulfilled the requirements of the Fourth Year in the School of Practical Science are eligible for the degree of Bachelor of Applied Science in the University of Toronto in accordance with a statute passed by the Senate in 1892, which, with the amendments since made, is as follows:

By the Senate of the University of Toronto.

Be it enacted:

That the Degree of Bachelor of Applied Science (B A.Sc.) be hereby established to be granted subject to the following conditions and regulations:

1. Candidates for the said degree shall hold the diploma of the School of Practical Science in any one of the regular courses of the said School, or shall be of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy in the University of Toronty.
2. They shall have fulfilled the conditions relating to the Fourth or Post-Graduate year in the School of Practical Science, and shall present certificates of having done so to the Registrar of the University. Honors may be granted with such certificates by the Faculty of the School.
3. Each candidate shall prepare a Thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University examiners. This Thesis is to be

accompanied by all necessary drawings, specifications, tables and estimates. To pass in the Thesis a candidate must obtain fifty per cent., and to take honors seventy-five per cent., of the marks assigned.

4. Candidates will be required to select two sub-divisions in any one of the following groups, and to pass such written and oral examinations on the subjects selected as may be prescribed by the University examiners.

A. { Astronomy.
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Elecricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all candidates who select group C.

To pass in each subject thirty-three per cent., and to take honors sixty-six per cent. of the marks assigned will be required.

5. The degree with honors will be conferred on candidates who obtain three out of the four honors possible.

Viz.– Certificate with honors .....(cl. 2.)
Thesis with honors .....(cl. 3.)
Honors in each subject of examination ...(cl. 4.)

6. Candidates are required to send to the Registrar of the University at least three weeks before the commencement of the annual examinations an application for examination according to a printed form to be obtained from the Registrar, and such application must be accompanied by a fee of ten dollars.

7. The examination for the degree shall be held in May.

8. The fee for the degree shall be ten dollars and shall be paid to the Registrar not later than the first day of May.

9. The ordinary time for conferring the degrees shall be at the University commencement in June. The degrees may be conferred at any meeting of the Senate.

10. The thesis, drawings, and other papers accompanying them, shall be the property of the University.

11. In case any change be made in the conditions referred to in the second clause, such change shall be submitted to the Senate and shall have no force so far as the said clause is concerned unless approved by resolution of the Senate.

SUBSEQUENT PROFESSIONAL DEGREES.

The attention of graduates is directed to the following statute, passed by the Senate of the University of Toronto in 1896:

BY THE SENATE OF THE UNIVERSITY OF TORONTO.

Be it enacted—

I. That all previous Statutes of the University relating to degrees or diplomas in Engineering be repealed.

II. That the following degrees be hereby established, viz., Civil Engineer (C. E.), Mining Engineer (M. E.), Mechanical Engineer (M. E.), Electrical Engineer (E. E.)

III. That the following be the conditions and regulations governing the conferring of the said degrees:

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science and the degree of Bachelor of Applied Science of the University of Toronto, except in the case provided for in clause 11 hereunder.

2. He shall have spent at least three years after receiving the degree of Bachelor of Applied Science in the actual practice of the branch of Engineering wherein he is a candidate for a degree.

3. Intervals of non-employment or of employment in other branches of Engineering shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Satisfactory evidence shall be submitted to the University Examiners as to the nature and length of the candidate's professional experience for the purposes of clauses 2 and 3.

   The Examiners shall satisfy themselves by oral or written examinations in regard to the candidate's experience and competence.

5. The candidate shall prepare an original Thesis on some engineering subject in the branch in which he wishes a degree; the said Thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications, and estimates.

   The candidate may be required at the option of the Examiners to undergo an examination in the subject of this Thesis.

6. Notice in writing shall be sent to the Registrar not later than the first day of February, informing him of the degree to which the candidate wishes to proceed, and of the title of his proposed Thesis, for the approval of the Senate.

7. The evidence under clause 4, and the Thesis, with accompanying papers, described in clause 5, shall be sent to the Registrar not later than the first day of May.

8. The candidate shall be required to present himself for examination in the month of May at such times as may be arranged by the Registrar.

9. The fee for any one of the said degrees shall be twenty dollars, and shall be paid to the Registrar not later than the first day of May.

10. The Thesis, drawings and other papers submitted under clause 7 shall become the property of the University.

11. Candidates who graduated from the School of Practical Science before June, 1895, shall not be required to hold the degree of Bachelor of Applied Science.

For further information apply to the Registrar of the University of Toronto.

DOMINION AND ONTARIO LAND SURVEYORS.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Ontario Land Surveyors, which will enable the students, who, after examination, obtain certificates therein and who have otherwise fulfilled the provisions of the

said Statutes, to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and Survey of Lands. (Cap. 152, R.S.O.)

" 12.—(2) Any person who has followed a regular course of study at the Ontario School of Practical Science in the subjects of drawing, surveying and levelling, and geodesy and practical astronomy, and who has thereupon received, after due examination, a certificate of having passed one session, two sessions, or three sessions, as the case may be, in the study of the aforesaid subjects, may, after having passed the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, be received as an apprentice by any practising land surveyor, and shall thereupon, if he has received a certificate of having passed three sessions in the study of the said subjects be only holden to serve as such apprentice during twelve successive months of actual service ; or, in case he has received a certificate of having passed only one or two sessions, as the case may be, in the study of the said subjects, then, for such time of actual service as, with the period spent by him at such session or sessions, suffices to make up the full term of three years.

" (3) After such actual service, such person shall, subject to the other provisions of this Act, have the same right to present himself for and to undergo the examination required by law and, if found qualified, then to be admitted to practice as a land surveyor, as if he had served the full three years' apprenticeship otherwise required by law.

" 14. The privi'ege of a shorter term of apprenticeship shall also be accorded to any graduate of the Military College at Kingston and of the Ontario School of Practical Science, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bounden to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

Extract from the Dominion Lands Act.

" Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all branches of education required by this Act for admission as a Dominion Land Sur-

veyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The attention of the Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

Extracts from the Ontario Architects' Act.

" 21. Any student who has matriculated in Arts in any University in Her Majesty's dominions, or in the Ontario School of Practical Science, shall not be required to pass the preliminary examinations.

" 23. Any person who applies for admission to registration as an architect after the coming into force of this Act, shall be not less than twenty-one years of age, shall have served as a student not less than five years with a principal or principals entitled to register under this Act, or with any other principal or principals approved by the council, and have passed such qualifying examinations as may be required by this Act.

" 24.—(3) Any person who has graduated from the Ontario School of Practical Science shall be required to serve only three years as a student, one of which three years may be served during the vacation of such school.

" (4) Upon and after the passing of this Act, students shall serve such term as is required to be served by the provisions of this Act, under indenture, to a registered architect, which indenture and any assignment thereof with affidavit of execution thereto attached shall be filed with the Registrar upon payment of such fees as the council may, by regulation, direct."

SYNOPSIS OF THE COURSES OF LECTURES

AND PRACTICAL INSTRUCTION.

Text-books for the first year marked (*a*) ; for second year (*b*) ; for third year (*c*) and for fourth or post graduate year (*d*).

SUBJECTS TAUGHT BY THE FACULTY OF THE SCHOOL.

Subjects.	Instructors.
Organic and Inorganic Chemistry, Applied Chemistry,	W. H. Ellis, M.A., M.B., Professor. W. Lawson, B.A.Sc., Fellow.
Mineralogy and Geology, Petrography, Metallurgy and Assaying, Mining and Ore-dressing, German.	A. P. Coleman, M.A., Ph.D., Professor. G. R. Mickle, B.A., Lecturer. W. E. Boustead, B.A.Sc., Acting Demonstrator.
Statics, Dynamics, Strength of Materials, Theory of Construction, Compound Stress, Hydraulics, Thermodynamics and Theory of the Steam Engine, French.	J. Galbraith, M.A., Professor. J. A. Duff, B.A., Lecturer. W. Minty, B.A.Sc., Fellow.
Drawing, Architecture, Plumbing, Heating and Ventilation, Mortars and Cements, Brick and Stone Masonry.	C. H. C. Wright, B.A.Sc., Lecturer. Jos. Keele, B.A.Sc., Fellow.
Surveying, Geodesy and Astronomy, Spherical Trigonometry, Least Squares, Descriptive Geometry.	L. B. Stewart, D.T.S., Lecturer. A. T. Laing, B.A.Sc., Fellow.
Electricity, Magnetism, Machine Design, Mechanics of Machinery, Rigid Dynamics.	T. R. Rosebrugh, M.A., Lecturer. A. E. Blackwood, Grad. S.P.S., Fellow.

SUBJECTS TAUGHT BY THE UNIVERSITY PROFESSORIATE

Algebra, Euclid, Plane Trigonometry, Analytical Geometry, Calculus, Astronomy.	Alfred Baker, M.A., Professor. A. T. DeLury, B.A., Lecturer. W. J. Rusk, B.A., Fellow.
Sound, Light, Heat, Electricity and Magnetism, Hydrostatics.	Jas. Loudon, M.A., LL.D., Professor. C. A. Chant, B.A., Lecturer. W. J. Loudon, B.A., Demonstrator. J. C. McLennan, B.A., Assistant Demonstrator.
Inorganic and Physical Chemistry.	W. H. Pike, M.A., Ph.D., Professor. W. L. Miller, B.A., Ph.D., Demonstrator.

DRAWING.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference.—Davidson—Projections.
Angel—Plane and Solid Geometry.
Binn—Orthographic Projection.
Millar—Descriptive Geometry, (*a*), (*b*).
Warren—Stone Cutting (*c*).
MacCord — Lessons in Mechanical Drawing.
Worthen—Topographical Drawing, (*a*), (*b*), (*c*).

SURVEYING AND LEVELLING.

LAND SURVEYING.

Chain Surveys.
Compass and Theodolite Surveys.
Methods of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

LEVELLING.

Longitudinal and Cross Sections.
Plotting.

SETTING OUT.

Setting out Straight Lines and Curves.
Setting out Levels.

MENSURATION.

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacity of Reservoirs, etc.

Lectures are also given on the distinctive features of Mining and Hydrographic Surveying.

Text-Books.—Murray—Manual of Land Surveying (*a*).
Gillespie—Higher Surveying (*b*), (*c*), (*d*).
Henck or Trautwine—Railway Curves (*b*), (*c*).
Johnson—Theory and Practice of Surveying.

PRACTICAL ASTRONOMY AND GEODESY.

ORDINARY COURSE.

The work included in this course is sufficient to fulfil the requirements of the final examination for Provincial and Dominion land surveyors.

In astronomy the principal subjects are the determination of time, latitude and azimuth, and the general principles of the methods of determining longitude. Practical instruction is given in the methods of taking observations.

In geodesy all surveys, computations and methods of map construction are based upon the supposition that the earth is a sphere.

ADVANCED COURSE (FOURTH YEAR).

The work in this course is intended to fulfil the requirements of the final examinations for Dominion Topographical Surveyors. It is distinguished from the work of the ordinary course not so much by the subjects as by the degrees of refinement to which the investigations are carried.

In geodesy the earth is considered as a spheroid.

Text-Books.—Gillespie—Higher Surveying (*b*), (*e*), (*d*).
Green—Spherical and Practical Astronomy (*e*), (*d*).
Chauvenet—Spherical and Practical Astronomy.
Doolittle—Practical Astronomy.
Gore—Elements of Geodesy (*c*), (*d*).
Helmert—Hohere Geodasie.
Nautical Almanac, 1897 (*c*), (*d*).

APPLIED MECHANICS.

STATICS,

The calculation of the stresses in framed structure, solid and riveted beams, arches, etc. Both graphical and analytical methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS.

THEORY OF COMPOUND STRESS.

DESIGNING OF STRUCTURES in timber, iron and masonry—arches, retaining walls, roofs, bridges, etc.

DYNAMICS.

Representation and measurements of forces and motions.
Principles of work and energy.
Efficiency of machines. Friction.
Transmission of energy—belts, shafts, crank and connecting rod, etc.
Fly-wheels, governors.
Balancing of machinery, etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS.

Discharge of water through orifices, notches, etc. Flow in pipes, and open channels. Sewerage, Water-works, Water-power, Water-wheels, Turbines, Pumps, etc.

THERMODYNAMICS AND THEORY OF THE STEAM ENGINE.

Text-Books and Books of Reference.—Von Ott—Graphic Statics (*a*).

Du Bois—Graphic Statics.

" Strains in Framed Structures.

Johnson—Modern Framed Structures.

Merriman and Jacoby—Roofs and Bridges.

Merriman—Mechanics of Materials (*b*), (*c*), (*d*).

Rankine—Applied Mechanics (*c*),(*d*).

Lanza—Applied Mechanics (*d*).

Unwin—Testing of Materials of Construction.

Baker—Masonry construction (*d*).

Patton—Foundations (*d*).

Kidder—Architect and Builders' Pocket Book.

Low and Bevis—Machine Drawing and Design (*b*), (*c*).

Low—Machine Drawing (*a*), (*b*), (*c*).

Unwin—Elements of Machine Design (*c*).

Shann—Elementary Treatise on Heat (*c*), (*d*).

Peabody—Thermodynamics (*d*).

" Steam Tables (*d*).

Carpenter—Experimental Engineering (*d*).

Kennedy—Mechanics of Machinery (*b*), (*c*).

Text-Books and Books of Reference.—Merriman—Hydraulics (*c*), (*d*).
Bodmer—Hydraulic Motors, Turbines, etc., (*d*).
Innes—Centrifugal Pumps, Turbines and Water Motors (*d*).
Gerhard—House Drainage and Sanitary Plumbing (*c*).
Santo Crimp—Sewage Disposal Works.
Billings—Heating and Ventilation;
Trautwine—Engineer's Pocket Book.
Carnegie—Pocket Companion.

THEORY OF MECHANISM.

Principles of the transmission of motion without reference to force.

Pitch surfaces, spur wheels, bevel wheels, skew-bevel wheels, trains of wheelwork, teeth of wheels, cams, cranks, eccentrics, links, bands and pulleys, hydraulic connections, frictional gearing, link motion for slide valves, etc., etc.

Text-Books and Books of Reference.—Rankine—Machinery and Millwork.
Halsey—Slide Valve Gears.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (*c*).

ELECTRICITY.

Instruction is given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University. The work comprises—

Elementary Electricity and Magnetism.

Measuring Instruments—

Theory and uses in determining current, electromotive force, resistance, capacity, strength of field, magnetic inductance, etc., etc.

MATHEMATICAL THEORY OF ELECTRICITY.

APPLICATIONS OF ELECTRICITY—

Laboratory work and lectures on telegraph, telephone, dynamos, electric lighting; arc and incandescent systems, storage batteries, transmission of power by electricity, etc.

THEORY OF ALTERNATING CURRENT GENERATORS AND TRANSFORMERS.

Text-Books and Books of Reference.—Kennelly and Wilkinson—Practical Notes for Electric Students (*a*),(*b*).
Stewart and Gee—Practical Physics (*b*).
Kempe—Electrical Testing (*b*).
Cumming—Theory of Electricity (*c*).
Thompson, S. P.—Dynamo Electric Machinery (*c*), (*d*).
Kapp—Electric Transmission of Energy (*d*).
Blakesley—Alternating Currents(*d*).
Bedell and Crehore—Alternate Currents (*d*).
Fleming—Alternate Current Transformers, Vol. I. and II. (*d*).

Current numbers of the "Electrician," the "Electrical World," and "La Lumiere Electrique."

ARCHITECTURE.

HISTORY OF ARCHITECTURE—

Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

ORDERS OF ARCHITECTURE.

HISTORY OF ORNAMENT.

PRINCIPLES OF DECORATION.

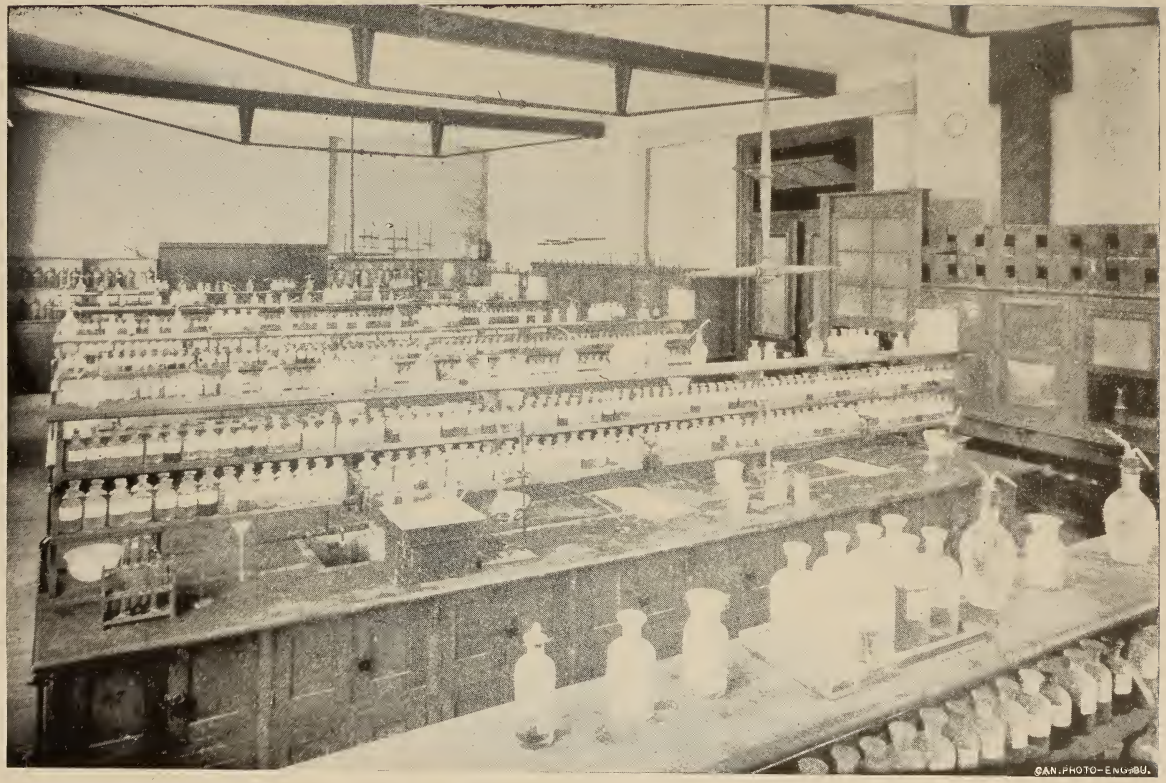
Text-Books and Books of Reference.—T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Fergusson—History of Architecture.
Rickman—Gothic Architecture.
Gwilt—Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture (*b*), (*c*).
Leeds—Orders of Architecture (*b*).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.

MATHEMATICS.

The Pure Mathematics included in this course is taught in the University of Toronto.

The Applied Mathematics is taught partly in the University and partly in the school.

Text-Books and Books of Reference.—Todhunter—Algebra (*a*).
" Spherical Trigonometry (*b*)
Mackay—Elements of Euclid (*a*)
Hall & Knight—Plane Trigonometry (*a*).
C. Smith—Conic Sections (*a*).
Osborne—Calculus.
Loomis—Calculus (*b*).
Newcomb & Holden—Astronomy (*b*).
Ganot—Physics (*b*).
Hamblin Smith—Hydrostatics (*b*).
Balfour Stewart—Heat.
Loudon & McLennan—Practical Physics (*b*).
Tyndall—Sound.



CHEMICAL LABORATORY—QUALITATIVE ANALYSIS.

MINERALOGICAL COLLECTION.

CHEMISTRY.

All the instruction in this subject is given in the School of Practical Science.

COURSES BY THE PROFESSOR OF CHEMISTRY OF THE UNIVERSITY OF TORONTO.

Inorganic Chemistry.
Organic Chemistry.
Chemical Theory.
Physical Chemistry.

COURSES BY THE PROFESSOR OF APPLIED CHEMISTRY OF THE SCHOOL OF PRACTICAL SCIENCE.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuels, Furnaces, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air, Sewage, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis of Food, Water and Air, and Toxicology.

Text-Books and Books of Reference.—Remsen—Inorganic Chemistry.
Richter—Inorganic Chemistry.
Richter—Organic Chemistry.
Roscoe & Schorlemmer—Treatise on Chemistry.
Miller, W. A.—Elements of Chemistry.
Meyer—Modern Theories of Chemistry.
Ostwald—Lehrbuch der Allgemeinen Chemie.
Ostwald—Outlines of General Chemistry.
Beilstein—Organic Chemistry.
Von Meyer & Jacobson—Lehrbuch der Organischen Chemie.
Thomson—History of Chemistry.
Wagner—Chemical Technology.
Sadtler—Organic Applied Chemistry.
Bloxham—Chemistry.
Fresenius—Qualitative and Quantitative Analysis.
Douglas & Johnson—Qualitative Analysis.
Sutton—Volumetric Analysis.

Text-Books and Books of Reference.—Continued.

Jones—Practical Chemistry.
Allen—Commercial Organic Analysis.
Post—Chemische Technische Analyse.
Winkler—Gas Analysis.
Blyth, A. W.—Poisons.
Blyth, A. W.—Foods.
Bolley—Handbuch der Chemischen Technologie.
Watt—Dictionary of Chemistry.
Thorpe—Dictionary of Applied Chemistry.
Meyer—History of Chemistry.
Wurtz—History of Chemical Theory.
Wurtz—Atomic Theory.
Van't Hoff—Chemistry in Space.
Pattison Muir—Thermo-Chemistry, Elements of.

MINERALOGY AND GEOLOGY.

MINERALOGY, GEOLOGY, MINING AND METALLURGY.

1. Mineralogy and Geology—
   Mineralogy and Crystallography.
   Geology and Palæontology.
   Lithology.
   Physical Geography.
   Blowpipe Analysis.
   Determinative Mineralogy.

Text-Books and Books of Reference.—Chapman—Mineralogy and Geology of Canada.
Dana—Manual of Geology.
Dana—System of Mineralogy.
Nicholson—Palæontology.
Geikie—Text-Book of Geology.
Plattner—Manual of Blowpipe Analysis.
Chapman or Brush—Mineral Tables.

2. Mining and Metallurgy—
   Mining Geology.
   Ore Dressing.
   Metallurgy of Iron and Steel.
   Metallurgy of Nickel, Copper, Silver, etc.
   Assaying.

Text Books and Books of Reference.— Ihlseng—Manual of Mining.
Kœhler—Bergbaukunde.
Kuhnhardt—Ore Dressing.
Phillips—Ore Deposits.
Balling—Metallhuettenkunde.
Schnabel—Allgemeine Huettenkunde.
Phillips and Bauerman—Elements of Metallurgy.
Mitchell—Assaying by Crookes.
Kerr—Probirkunst.
Kemp—Ore Deposits of the United States.

VACATION WORK.

Thesis and Construction Notes.

A subject is given at the end of each session on which the student is required to write a thesis (accompanied by drawings and specifications when necessary) during the subsequent vacation.

The engineering and architectural students are also required to make, during the vacation, full and clear notes of various constructions that may fall under their notice.

The value of both the thesis and the construction notes is taken into account in determining standing at the next following examination.

Civil Engineering.

Subject of Thesis for Second Year.—Roads, Streets and Pavements.
" *Third* " Sanitary Drainage.

Books of Reference.—Gillmore—Roads, Streets and Pavements.
Spalding—Roads and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Mining Engineering.

Subject of Thesis for Second Year.—Ore-dressing.
Third " Mining.

Books of Reference.—Kuhnhardt—Ore-dressing in Europe.
Ihlseng—Manual of Mining.

Mechanical and Electrical Engineering.

Subject of Thesis for Second Year.—Machine-shop Practice.
" *Third* " Foundry Practice.

Books of Reference.—Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

Architecture.

For the second year the following set of freehand pencil sketches is required :

I. Doorway from the object ;
II. Staircase "
III. Fireplace, with cross sections ;
And seven sheets from the object, prints or drawings, with plans and sections where possible.

Subject of Thesis for Second Year.—The above sketches.
" *Third* " Twelve water-color studies.

Analytical and Applied Chemistry.

Subject of Thesis for Second Year.—Sulphuric Acid and Alkali Manufacture.
" *Third* " Coal Tar Products.

Books of Reference.—Lunge—Manufacture of Sulphuric Acid and Alkali.
Wagner—Chemical Technology.
Thorpe—Dictionary of Applied Chemistry.

Any other works on the above subjects may be consulted and results of original observations should be given.

ENGINEERING LABORATORY.

This Laboratory occupies two floors, having a total area of 10,000 square feet. It consists of three departments, viz. :

(*a*) The department for testing materials of construction.

(*b*) The department for investigating the principles governing the application of power. This department is sub-divided into the steam laboratory, the hydraulic laboratory and electrical laboratory.

(*c*) The department for investigating problems connected with standards of length, time, astronomical observations, etc.

In order to prepare specimens for the testing machines, a shop has been fitted up with a number of high-class machine tools specially suited for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labor. It is also supplied with the necessary appliances for making ordinary repairs.

The machines in the department for testing materials are the following :

An Emery 50-ton machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A Riehle 100-ton machine for making tests in tension, compression, shearing and cross-breaking. It will take in posts twelve feet long and beams up to eighteen feet in length.

An Olsen torsion machine for testing the strength and elasticity of shafting. This machine will twist shafts up to sixteen feet in length and two inches in diameter.

A Riehle 2,000 pounds cement testing machine. The cement testing room is fitted with all the usual accessories.

The equipment of the power department is as follows :

A Babcock and Wilcox 52-horsepower boiler.

A Harrison-Wharton 12-horsepower boiler.

A 50-horsepower Brown engine. This engine was constructed specially for experimental investigation. It is steam jacketted and has three alternative exhausts, to the open air, to a jet condenser, and to a Wheeler surface condenser, kindly presented to the School by Mr. F. M. Wheeler, of New York, the inventor.

There are also a Blake circulating pump, a Knowles air pump and a Blake feed pump, the latter of which was a gift from the manufacturers.

A machine for testing lubricating oils and measuring journal friction, built by Riehle Bros., of Philadelphia.

The hydraulic division of the laboratory is furnished with a three-throw pump with double acting cylinders. It has a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices and weirs, measuring tanks, etc. A three-feet jet turbine, a nine-inch McCormick, and a six-inch New American turbine, the latter the gift of the firm of William Kennedy & Sons, Owen Sound, form a part of the same equipment.

The power department is equipped with the usual measuring instruments, indicators, gauges, gauge testing apparatus, scales, brakes, dynamometers.

The shafting is driven by a 7-horsepower Otto gas engine, a 20 kw. Edison motor, and the Brown engine above described.

In the geodetic and astronomical department are a 100-feet and a 66-feet standard of length ; a 10-foot Rogers comparator with graduating attachment ; a Kater's pendulum ; a Howard astronomical clock and electro-chronograph ; a Troughton & Simms 10-inch theodolite and all the ordinary surveying instruments.

Electrical Laboratory.

The first section of this laboratory is the engineering division, in which a 20-kilowatt motor furnishes power to drive several continuous current dynamos of constant potential and constant current, as well as an alternator. There are constant potential motors of 6-horsepower and 3-horsepower, besides some smaller motors, among which is one for alternating current, and it is expected that this year there will be added a polyphase motor, and a rotary converter.

On the walls, besides rheostats, are four types of transformers, and meters for continuous and alternating currents. Arc lamps of seven types are hung around the laboratory, and incandescent lamps which may be used for the purposes of a rheostat.

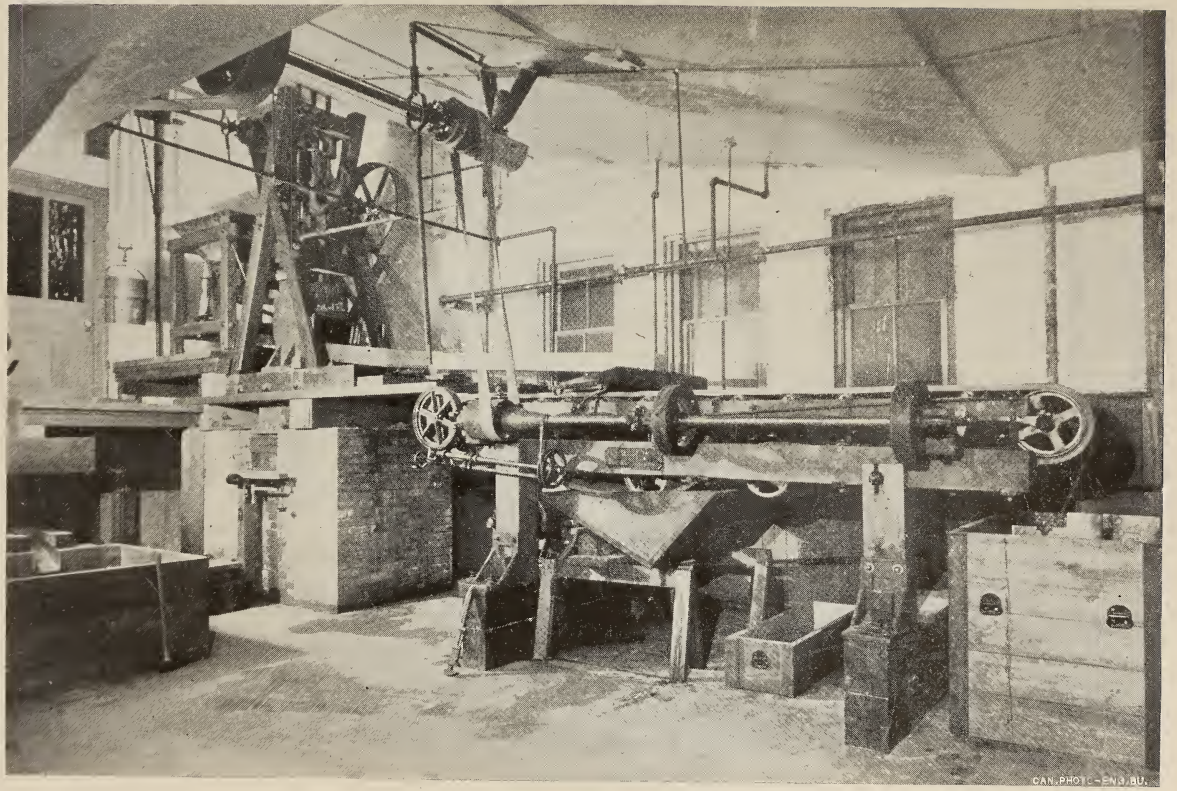
There are also a battery of Roberts' storage cells, and several chloride accumulators.

A new switchboard is to be constructed during the summer, which, in addition to affording facility for interconnection, will also carry measuring instruments which may be readily introduced into any circuit.

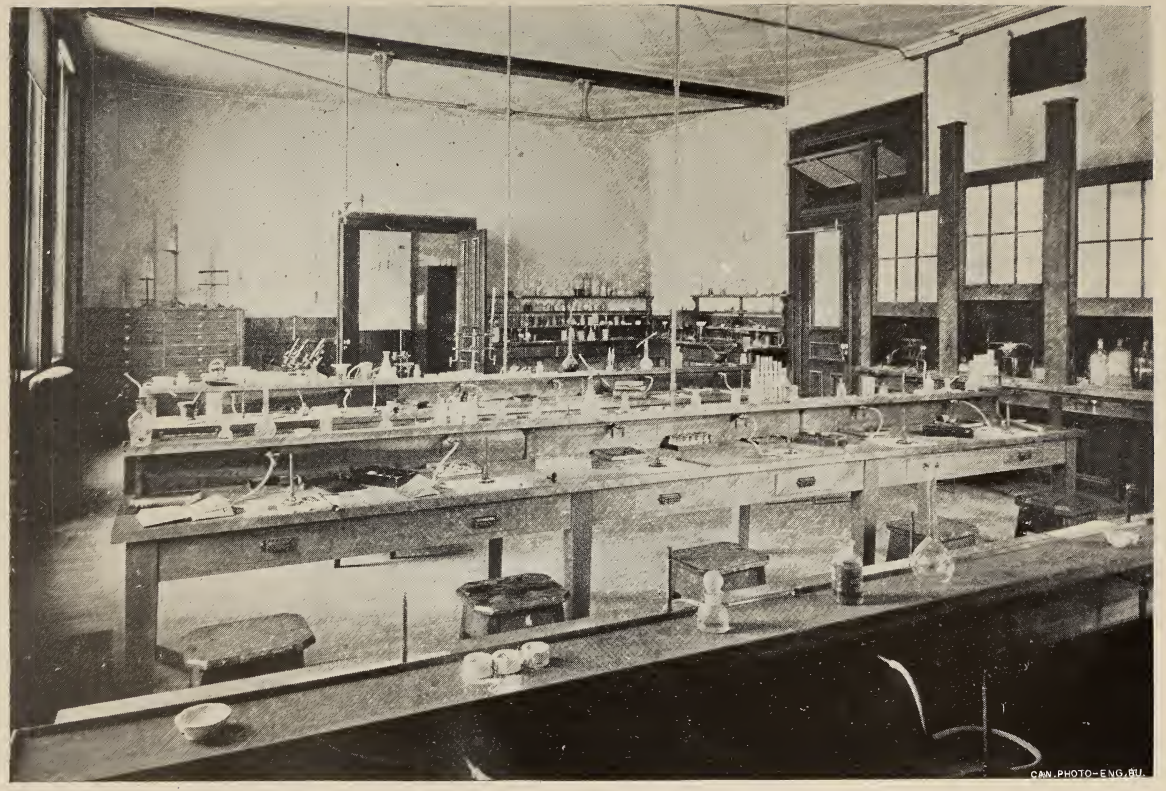
A Thomson balance, multicellular electrostatic voltmeter, and high potential electrostatic voltmeter, a Siemens' electrodynamometer, and standard Weston measuring instruments furnish the means either of accurate observation or for standardization of instruments for ordinary use. These are generally used in a separate room to which connection is made.

The second section of the electrical laboratory is a room 24 by 49 ft., in another part of the basement, from which iron has as far as possible been removed. Here ten masonry piers support galvanometers, an electrometer, and other mirror reflecting instruments, and testing work can be done free from disturbing influences.

Fume cupboards and sinks have been provided for work with galvanic and storage cells ; the room is also supplied with Wheatstone bridges, Kohlrausch apparatus for electrolytes, standard divided microforad con-



STAMP MILL.



BLOW-PIPE LABORATORY.

denser, Clark cells, and other apparatus. Wires eading from this room to the switchboard allow measurements to be made here in connection with experiments in the other laboratory

Connections to the 110-volt circuit of the city are accessible in all the rooms.

THE CHEMICAL LABORATORIES.

The chemical laboratories comprise a laboratory for qualitative analysis with accommodation for forty students working at one time, a laboratory for quantitative analysis capable of accommodating twenty students at a time, and smaller rooms for special work, such as water analysis, technical gas analysis, etc. The laboratories are fitted with the usual appliances.

BLOWPIPE AND ASSAYING LABORATORIES.

Six rooms are provided in this department, including a blowpipe laboratory with tables and other appliances for thirty-six students at a time; an assaying laboratory, with gas and charcoal furnaces; a balance room, titration laboratory and store-rooms, with the equipment necessary for wet and dry assays. Lithological microscopes and a lathe with all necessary facilities for the preparation and study of thin rock sections have been provided.

STAMP MILL.

A Fraser & Chalmers three-stamp mill, a Frue vanner, a Dodge crusher and other apparatus, necessary for the separation of minerals on a larger scale than in the ordinary assay laboratory, have been added to the equipment in mining. These appliances will enable a mill test of a ton or more of ore to be made, instead of an assay of a hand sample, thus affording a much more reliable index than was hitherto possible of the value of a mining property.

PHYSICAL LABORATORY.

(University of Toronto.)

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of mechanics, sound, light, heat and electricity. It is also well supplied with instruments of precision for individual work in the

same departments. In addition to an elementary laboratory, there are several special laboratories, which offer unusual facilities for the conduct of experiments in the various branches of physics.

The electrical apparatus includes electrometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre), Ruhmkorff coils, Crookes' tubes, telephones, etc., etc.

MODERN LANGUAGES.

No special examinations are held in these languages except in the Fourth Year, but it is expected that every student in a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

LIBRARY, MUSEUMS, ETC.

The Library is supplied with a number of the more important scientific and technical periodicals. A valuable collection of works of reference on the subjects of study pursued in the School has been formed and is being added to year by year.

Several thousand specimens have been procured for the museum, which now contains mineralogical, lithological, metallurgical, and palæontological collections, affording a wide range of material for instruction in the subjects of Mineralogy, Geology and Metallurgy.

The large and valuable exhibit of minerals sent by the Ontario Government to the Columbian Exhibition at Chicago has been presented to the School.

A beginning has also been made in the collection of specimens illustrating Industrial Chemistry and Architecture.

SOCIETIES.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

OFFICERS FOR 1895-96

President ..... G. M. Campbell.
Vice-President ..... T. D. Wright.
Secretary ..... E. Richards.
Treasurer ..... H S. Carpenter.
Corresponding Secretary ..... W. C. Gurney.

Librarian ..... R. R. Shipe.
Representatives—Graduates ..... A. T. Laing.
Fourth Year ..... H. S. Hull.
Third Year ..... W. F. Laing.
Second Year ..... E. Andrewes.
First Year ..... R. M. Bertram.

The Society meets every second Wednesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

ALUMNI ASSOCIATION OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1895.

President ..... James McDougall, B. A.
First Vice-President ..... H. J. Chewett, B. A. Sc.
Second Vice-President ..... W. A. Lea, B. A. Sc.
Councillors ..... E. B. Merrill, B.A., B. A. Sc.
T. R. Deacon, O. L. S.
J. A. Ewart, B. A. Sc.
A. V. White.
S. M. Johnson, B. A. Sc.
Secretary-Treasurer ..... A. T. Laing, B. A. Sc.

Graduates are requested to keep the Secretary acquainted with their addressses.

ELECTRICAL ASSOCIATION.

Officers for 1895-96.

Honorary President ..... H. S. Hull.
President ..... E. I. Sifton.
Secretary-Treasurer ..... H. P. Elliott.
Fourth Year Representative ..... W. M. Brodie.
Third Year " ..... R. R. Lawrie.
Second Year " ..... H. L. Vercoe.
First Year " ..... A. G. Piper.

SESSION 1895-96.

STUDENTS IN ATTENDANCE.

FIRST YEAR.

Regular Students.

3. Barber, T.
3. Berwick, J. R.
3. Bertram, R. M.
2. Carter, W. E.
3. Collins, C. D.
3. Darling, E. H.
3. Fisher, A. M.
3. Gordon, C. B.
1. Grant, W. F.
1. Gzowski, C. S.
1. Kormann, J. S.
3. Lamb, C. M.
4. Mackintosh, D.
3. McMichael, C.
1. McNaughton, F. D.
4. Morphy, E. J.
3. Roper, W. P.
1. Shaw, J. H.
3. Smallpiece, F. C.
1. Smith, R.
1. Stovel, H. R.
3. Tye, C. H.
3 Williamson, D. A.
3. Wilkinson, T. A.
1. Willson, R. D.

Special Students Taking Full Courses.

3. Boyd, W. H.
3. Boyd, V.
1. Bray, L. T.
1. Chaplin, G. W.
3. Dawson, R.
3. Fitzgibbons, R. G.
3. Henderson, D. R.
2. Lea, E. P.
3. Little, F.
3. Mackenzie, G. C.
1. Perry, F. N.
3. Piper, A. G.
3. Sheldon, S.
3. Shipley, A. E.

SECOND YEAR.

3. Alexander, F. H.
2. Andrewes, E.
3. Bain, J. A.
2. Bow, J. A.
1. Carpenter, H. S.
5. Charlton, H. W.
3. Gray, A. T.
3. Hicks, W. A. B.
4. King, C. F.
3. Morrison, H.
1. Parker, W. G.
1. Proudfoot, H. W.
3. Richards, E.
2. Robinson, A. H.
4. Scott, W. F.
3. Smillie, R.
3. Stacey, G. E.
2. Stull, W. W.
3. Vercoe, H. L.
1. Weekes, M.
1. Weldon, E. A.

THIRD YEAR.

2. Bain, J. W.
2. Burwash, L. T.
3. Campbell, G. M.
2. De Cew, J. A.
3. Elliott, H. P.
3. Fowler, C. P.
3. Gurney, W. C.
3. Haight, H. V.
1. Laing, W. F.
3. Lawrie, R. R.
3. Macbeth, C.
3. MacMurchy, J. A.
1. Martin, T.
3. Shipe, R. R.
5. Miss E. M. Curzon.

FOURTH YEAR.

Armstrong, J.
Boswell, E. J.
Brodie, W. M.
Dobie, J. S.
Hull, H. S.
McGowan, J., B.A.
Macallum, A. F.
McKinnon, H. L.
Mines, W.
Robinson, F. J.
Tremaine, R. C. C.

SPECIAL STUDENTS TAKING PARTIAL COURSES.

Fitzgerald, G. G.—Surveying.

Gray, J. M.—Chemistry.

Johnson, G.—Mineralogy, Geology, Assaying, and Metallurgy.

Kingsford, G. E.—Statics, Dynamics, Electricity, and Drawing.

Kitely, H.—Mineralogy.

McMillan, A. N.—Chemistry and Mineralogy.

Mollins, C. B.—Surveying.

Sanderson, A.—Electricity.

Sifton, E. J.—Electricity.

Staunton, W. J.—Chemistry.

Troup, W. J.—Mathematics, Drawing, Engineering and Surveying.

Tye, A. T.—Mining Engineering.

Webster, E. B.—Surveying.

Wright, T. D.—Mechanical and Electrical Engineering.

PRIZEMEN.

Engineering.

1879.—	I.	Year.....	J. McAree	1st prize.
1880.—	II.	Year.....	J. L. Morris.....	1st prize.
1881.—	I.	Year.....	G. H. Duggan	1st prize.
	II.	Year.....	D. Jeffrey.....	1st prize.

PRIZEMEN.—*Continued.*

1882.—	I.	Year.....A. R. Raymer.....	1st prize.
	"	" .....E. W. Stern.....	2nd prize.
	II.	Year.....G. H. Duggan.....	1st prize.
	III.	Year.....D. Jeffrey.....	1st prize.
1883.—	I.	Year.....B. A. Ludgate.....	1st prize.
	"	" .....A. M. Bowman.....	2nd prize.
	II.	Year.....A. R. Raymer.....	1st prize.
	"	" .....E. W. Stern.....	2nd prize.
	III.	Year.....G. H. Duggan	1st prize.
1884.—	II.	Year.....B. A. Ludgate.....	1st prize.
	III.	Year.....E. W. Stern.....	1st prize.
	"	" .....A. R. Raymer.....	2nd prize.
1885.—	I.	Year.....A. F. Lott	1st prize.
	"	" .....J. Roger	2nd prize.
	II.	Year.....T. K. Thomson.....	1st prize.
	III.	Year.....B. A. Ludgate.....	1st prize.
1886.—	I.	Year.....C. H. C. Wright.....	1st prize.
	"	" .....J. E. Ross	2nd prize.
	II.	Year.....A. E. Lott	1st prize.
1887.—	I.	Year.....H. E. T. Haultain	1st prize.
	II.	Year.....C. H. C. Wright.....	1st prize.
	III.	Year..... A. E. Lott	1st prize.
	"	" .....J. Roger	2nd prize.
1888.—	I.	Year .....E. B. Merrill	1st prize.
	"	" .....F. M. Bowman.....	2nd prize.
	II.	Year.....D. D. James	1st prize.
	III.	Year.....C. H. C. Wright.....	1st prize.
1889.—	I.	Year.....J. K. Robinson.....	1st prize.
	"	" .....G. E. Silvester	2nd prize.
	II.	Year.....E. B. Merrill.....	1st prize.
	"	" .....F. M. Bowman.....	2nd prize.
	III.	Year.....D. D. James	1st prize.

PRIZEMEN.—*Continued.*

1890.—	I.	Year	C. Fairchild	1st prize.
	II.	Year	J. K. Robinson	1st prize.
	III.	Year	F. M. Bowman	1st prize.
	"	"	E. B. Merrill	2nd prize.
1891.—	I.	Year	A. J. McPherson	1st prize.
	"	"	R. B. Watson	2nd prize.
	II.	Year	J. B. Goodwin	1st prize.
	III.	Year	G. E. Silvester	1st prize.
	"	"	C. W. Dill	2nd prize.
1892.—	I.	Year	A. E. Bergey	1st prize.
	"	"	R. W. Angus	2nd prize.
	II.	Year	A. J. McPherson	1st prize.
	"	"	R. B. Watson	2nd prize.
	III.	Year	E. J. Laschinger	1st prize.
	"	"	C. Fairchild	2nd prize.

The grant for prizes was withdrawn at the close of 1892.

ARCHITECTURE.

The prize in Architecture is the gift of Mr. D. B. Dick, Architect, Toronto.

1891.—	I.	Year	H. Ballantyne.
1892.—	I.	Year	J. A. Ewart.
1893.—	I.	Year	A. Harkness.
1894.—	I.	Year	E. A. Forward.
1895.—	I.	Year	W. F. Scott.

GRADUATES

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

Year.	—	Name.	Address.
1892..	1	Alison, T. H., B.A.Sc., Draftsman, Post & McCord	239 4th Ave., New York.
1892..	1	Allan, J. R., O.L.S	Renfrew, Ont.
1892..	1	Anderson, A. G	Port Dover, Ont.
1894..	3	Angus, R. W., Consulting Mechanical Engineer	Room 44, Standard Blk., Cleveland, O.
1888..	1	Apsey, J. F., O.L.S., Resident Engineer Baltimore Belt R. R	2125 N. Congress St., Baltimore, Md.
1893..	1	Ardagh, J. A	Barrie, Ont.
1895..	1	Armstrong, J., School of Practical Science, Post Graduate Course	Toronto, Ont.
1888..	1	Ashbridge, W. T	1444 Queen St. E., Toronto, Ont.
1888..	1	Ball, E. F., A.M. Can. Soc. C.E., Surveyor and Consulting Engineer	Rockvale, Colo.
1893..	4	Ballantyne, H. F., B.A.Sc., Architect	114E. 23rd St., New York.
1894..	1	Barker, H. F	Orillia, Ont.
1891..	1	Beatty, H. J., O.L.S	Pembroke, Ont.
1894..	3	Beauregard, A. T., B.A.Sc., Testing Dept. General Electric Co	Schenectady, N. Y.
1894..	1	Bergey, A. E	Mannheim, Ont.
1895..	3	Blackwood, A. E., Fellow in Electrical Engineering, School of Practical Science	Toronto, Ont.
1885..	1	Bleakley, F. W	Room 46, Sullivan Block, Seattle, W. T.
1895..	1	Boswell, E. J., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1890..	5	Boustead, W. E,, B.A. Sc., Acting Demonstrator in Mineralogy, School of Practical Science	Toronto, Ont.
1886..	1	Bowman, A. M., D. & O.L.S., Staff U. S. Engineers, Ohio River Improvement	Mahan, Beaver Co., Pa.
1890..	1	Bowman, F. M., C.E., O.L.S., Assistant Engineer, Riter & Conley	Alleghany, Pa.
1885..	1	Bowman, H. J., D. & O.L.S , A.M. Can. Soc. C.E	Town Engineer, Berlin, Ont.
1894..	3	Boyd, D. G	Waterous Engine Works, Brantford, Ont.
1895..	3	Brebner, G	Sarnia, Ont.
1895..	3	Brodie, W. M., School of Practical Science (Post-graduate course)	Toronto, Ont.
1888..	1	Brown, D. B , O.L.S., Mexican Southern R.	Old Mexico.
1893..	1	Brown, G. L	Morrisburg, Ont.
1895..	3	Brown, L. L , Locomotive Dept., N.Y., N. H. & H. Ry	New Haven, Conn.
1890..	1	Bucke, M. A	Slocan Star Mines, Sandon, B.C.

GRADUATES.—*Continued.*

Year.	—	Name.	Address.
1894..	3	Bucke, W. A., B.A. Sc.	Royal Electric Co., Montreal, P. Q.
1883..	1	Burns, D., O.L.S., A. M. Can. Soc. C.E., Engineer's Staff, Pennsylvania Co.	Pittsburgh, Pa.
1887..	1	Burns, J. C., deceased	.....
1888..	1	Canniff, C. M.	City Surveyor's Office, Toronto, Ont.
1889..	1	Carey, B	Engineer's Office, Toronto
1895..	4	Campbell, R. G.	St. Catharines, Ont.
1894..	1	Chalmers, J., Assistant Engineer, T. H. & B. Ry	Hamilton, Ont.
1889..	1	Chalmers, W. J	Cayuga, Ont.
1893..	1	Charlesworth, L. C.	Assistant to E. Stewart, Collingwood, Ont.
1888..	1	Chewett, H. J., B.A. Sc., A. M. Can. Soc. C.E., Civil and Mining Engineer	83½ York St., Toronto.
1889..	1	Clement, W. A	City Engineer's Office, Toronto, Ont.
1895..	3	Connor, A. W., B.A	Hamilton Bridge Co., Hamilton, Ont.
1890..	1	Corrigan, G. D., deceased	.....
1891..	1	Deacon, T. R., O.L.S.	Town Engineer, Rat Portage, Ont.
1891..	1	Dill, C. W.	Town Engineer, Tonawanda, N.Y.
1895..	1	Dobie, J. S., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1890..	1	Duff, J. A., B.A., Lecturer in Applied Mechanics, School of Practical Science	Toronto, Ont.
1883..	1	Duggan, G. H., M. Can. Soc. C.E., Chief Engineer, Dominion Bridge Co	Montreal, P.Q.
1893..	1	Dunn, T. H.	Asst. to G. L. Brown, Morrisburg, Ont.
1890..	1	English, A. B.	106 Gould st., Toronto.
1894..	4	Ewart, J. A., B.A. Sc, Architect	Arnoldi & Ewart, Architects, Ottawa, Ont.
1893..	1	Fairbairn, J. M. R.	Peterborough, Ont.
1892..	1	Fairchild, C., O.L.S	Simcoe, Ont.
1893..	4	Fingland, W., Architect	307 W. 119th St., New York.
1893..	1	Forester, C	Gormley, Ont.
1893..	1	Francis, W. J.	Asst. Engineer, Union Station, Toronto, Ont.
1890.	1	Garland, N. L	Eglington, Ont.
1888..	1	Gibbons, J., D. & O.L.S	Department of the Interior, Ottawa, Ont.
1893..	3	Goldie, A. R.	Assistant manager Goldie & McCulloch Co. Ltd., Galt, Ont.
1892..	1	Goodwin, J. B., B.A. Sc.	Town Engineer's Office, Niagara Falls, Ont.
1895..	1	Guernsey, F. W.	Port Hope, Ont.
1893..	3	Hanly, S. C.	A. R. Williams Machinery Co. Ltd., Toronto.
1889..	1	Hanning, G. F.	City Engineer's Office, Toronto, Ont.

GRADUATES.—*Continued.*

Year.	—	Name.	Address.
1895..	4	Harkness, A. H.	Curry, Baker & Co., Architects, Toronto.
1889..	1	Haultain, H. E. T.	Mining Engineer Barberton, South Africa.
1885..	1	Henderson, E. E., O.L.S	Henderson P.O., Piscataquois, Me.
1894..	3	Herald, W. J., B.A. Sc	Hamilton, Ont.
1886..	1	Hermon, E. B., D. & O.L.S.	Gordon, Hermon & Burwell, Vancouver, B.C.
1895..	3	Hull, H. S., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1890..	1	Hutcheon, J., O.L.S	City Engineer, Guelph.
1890..	1	Innes, W. L., O.L.S., C.E	Ranney & Innes, Civil Engineers and Surveyors, Peterboro', Ont.
1889..	1	Irvine, J.	Harriston, Ont.
1889..	1	James, D. D., B.A., B.A. Sc., Engineers' Staff, N.Y.C. & H.R.R.R.	417 N. Division st., Buffalo, N. Y.
1891..	5	James, O. S., B.A. Sc.	19½ Victoria St., Toronto.
1882..	1	Jeffrey, D	Contractor, Stratford, Ont
1894..	3	Job, H. E., B.A. Sc.	Kay Electric Co., Hamilton, Ont.
1894..	1	Johnson, S. M., B.A. Sc., O.L.S.	Asst. Eng'r. Trail Creek Tramway Co., Rossland, B. C.
1894..	3	Johnston, A. C., B.A. Sc	Ontario Peat Fuel Co., Toronto, Ont.
1894..	1	Jones, J. E	Ridgeway, Pa.
1893..	4	Keele, J., B.A. Sc., Fellow in Civil Engineering, School of Practical Science	Toronto, Ont.
1882..	1	Kennedy, J. H., C.E., O.L.S., Architect, etc.	St. Thomas, Ont.
1884..	1	Kirkland, W. C.	Illinois Central Ry., New Orleans, La.
1893..	1	Laidlaw, J. T., B.A. Sc.	Cripple Creek, Colo.
1892..	1	Laing, A. T., B.A. Sc, Fellow in Surveying, School of Practical Science	Toronto, Ont.
1886..	1	Laird, R., O.L.S	14 Russell St., Toronto.
1891..	1	Lane, A., O.L.S	Structural Dept. Maryland Steel Co., Sparrows' Point, Md.
1892..	4	Langley, C. E., Architect	Langley & Langley, Architects, Toronto.
1892..	1	Laschinger, E. J., B.A. Sc	Consolidated Gold Fields of South Africa, Johannesburg, South African Republic.
1893..	3	Lash, F. L.	Engineer, Sugar Factory, Boedoeran, Java.
1894..	3	Lash, N. M.	Bell Telephone Co., Toronto, Ont.
1892..	5	Lawson, W., B.A. Sc., Fellow in Chemistry School of Practical Science	Toronto, Ont.
1892..	3	Lea, W. A., B.A. Sc.	Toronto Junction St.Ry., West Toronto Junc.

GRADUATES.—*Continued.*

Year.	—	Name.	Address.
1887..	1	Lott, A. E., Railway Construction	San Antonio de la Huerta, Mexico.
1885..	1	Ludgate, B. A., O.L.S.....	Denison, Texas.
1893..	1	McAllister, A. L., B.A. Sc.	Draftsman New Jersey Steel and Iron Co., Trenton, N. J.
1891..	1	McAllister, J. E., B.A. Sc.....	.....
1893..	1	Macallum, A. F., School of Practical Science (Post-graduate course).....	Toronto, Ont.
1882..	1	McAree, J., B.A. Sc., D.T.S.., O.L.S., Assayer and Surveyor	Dominion Gold Mining and Reduction Co. Ltd., Rat Portage, Ont.
1887..	1	McCullough, A. L., O.L.S., A.M. Can. Soc. C.E	Civil and Hydraulic Eng. Galt, Ont.
1888..	1	McDowall, R., O.L.S., A.M. Can. Soc. C.E.	Owen Sound, Ont.
1884..	1	McDougall, J., B.A., County Engineer	Court House, Toronto.
1892..	1	McEntee, B., B.A. Sc.....	28 Queen St. E., Toronto, Ont.
1888..	1	McFarlane, G. W., O. L. S., Assistant County Engineer.....	Court House, Toronto.
1893..	1	McFarlen, T. J	10 St. Vincent st., Toronto, Ont.
1895..	3	McGowan, J., B.A., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1885..	1	McKay, O., O.L.S	Windsor, Ont.
1895..	3	McKay, W. N.....	100 Madison ave., Toronto, Ont.
1895..	3	McKinnon, H. L., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1893 .	1	McPherson, A. J., B.A. Sc.....	Supt. Galt Waterworks, Galt, Ont.
1894..	1	McTaggart, A. L., B.A. Sc.....	Variety Iron Works, Cleveland, O.
1893..	1	Main, W. T.....	Brampton, Ont.
1888..	1	Marani, C. J., General Agent.....	Canada Permanent Loan Co., Vancouver, B.C.
1893..	1	Marani, V. G.	Cleveland Gas, Light & Coke Co., 49 Edgewood place, Cleveland, O.
1887..	1	Martin, F., O.L.S., M.D.....	Hospital for Sick Children, Toronto, Ont.
1895..	1	Meadows, W. W.	St. Thomas, Ont.
1890..	1&3	Merrill, E. B., B.A., B.A. Sc.....	J. H. McEwen, Mfg. Co., Ridgeway, Pa.
1888..	1	Mickle, G. R., B.A., Mining Engineer, Lecturer in Mining, School of Practical Science	Toronto, Ont.
1889..	1	Mill, F. X.....	268 Main St. E., Pittsburg, Pa.
1892..	3	Milne, C. G., B.A. Sc.....	Elmira Bridge Co., Elmira, N. Y.

GRADUATES.—*Continued.*

Year.	—	Name.	Address.
1893..	1	Mines, W., School of Practical Science (Post-graduate course)	Toronto, Ont.
1894..	3	Minty, W., B.A. Sc., Fellow in Mechanical Engineering, School of Practical Science..	Toronto, Ont.
1892..	1	Mitchell, C. H., B.A. Sc	Tyrrell & Mitchell, Engineers and Surveyors, Niagara Falls, Ont.
1889..	1	Moberly, H. K., Asst. Mechanical Engineer.	Youghiogheny River Coal Co., Scott Haven, Pa.
1891..	1	Moore, J. E. A., Draftsman	Riter and Conley, Allegheny, Pa.
1888 .	1	Moore, J. H., O.L.S	Smith's Falls, Ont.
1881..	1	Morris, J. L, C.E., O.L.S.	Pembroke, Ont.
1891..	1	Newman, W., O.L.S	Windsor, Ont.
1894..	3	Nicholson. C. J	156 George St., Hamilton.
1890..	1	Pedder, J. R., O.L.S	Doon, Ont.
1887..	1	Pinhey, C. H., D. & O.L.S.	Soulanges Canal, Coteau Landing, P. Q.
1892..	1	Playfair, N. L	131 Isabella st., Toronto.
1892..	1	Prentice, J. M., deceased	
1884..	1	Raymer, A. R., Asst. Division Engineer, Lake Shore and Michigan Southern R.R.	Toledo, Ohio.
1888..	1	Richardson, G. H., Divisional Eng'r. C.P.R.	Revelstoke, B. C.
1884..	1	Robertson, J., O.L.S	Coad & Robertson, Civil Engineers, P. L. Surveyors, etc., Glencoe.
1893..	3	Robertson, J. M.	62 Admiral Rd., Toronto.
1895..	1	Robinson, F. J., School of Practical Science (Post-graduate course)	Toronto, Ont.
1891..	1	Robinson, J. K., deceased	
1887..	1	Roger, J., O.L.S.	Mitchell, Ont.
1894..	1	Rolph, H	Pacific Rolling Mills, San Fransisco, Cal.
1888 .	1	Rose, K	Mexican Southern Ry., Mexico.
1889..	1	Rosebrugh, T. R., M.A., Lecturer in Electrical Engineering, School of Practical Science	Toronto, Ont.
1892..	1	Ross, J. A., Chief Draftsman L.S. & M.S. Ry	Toledo, O.
1888..	1	Ross, J. E., O.L.S.	Riverside, Cal.
1890..	3	Ross, R. A	Royal Electric Co., Montreal, P. Q.
1893..	1	Russel, R., Engineer's Staff, O.A. & P.S. Ry.	Pembroke, Ont.
1891..	1	Russel. W., Engineer's Staff, O.A. & P.S. Ry.	Pembroke, Ont.
1894..	1	Shields, J. D., B.A. Sc	78 Brunswick ave., Toronto, Ont.
1891..	1	Silvester, G. E., O.L.S.	Shiffler Bridge Co., Pittsburgh, Pa.
1892..	1	Smith, A	Keystone Bridge Co., Pittsburg, Pa.
1894..	1	Smith, Angus	Scane & Smith, Engineers and Surveyors, Ridgetown, Ont.
1893..	1	Speller, F. N., B.A. Sc	

GRADUATES.—*Concluded.*

Year.	—	Name.	Address.
1894..	3	Spotton, A. K.	Waterous Engine Works, Brantford, Ont.
1893..	1	Squire, R. H.	City Engineer's Office, Brantford, Ont.
1884..	1	Stern, E. W	Koken Iron Works, St. Louis, Mo.
1895..	3	Stocking, F. T.	Waubaushene, Ont.
1891..	1	Symmes, H. D.	Engineer St. Ry., St. Catharines, Ont.
1893..	1	Taylor, W. V.	Rathbun Co., Gananoque, Ont.
1892..	1	Thomson, R. W., B.A. Sc., Mining Engineer to the	Rand Colleries, Ltd., Brakpan, South African Republic.
1886..	1	Thomson, T. K., C.E., A.M. Can. Soc. C.E., Consulting Engineer	Stamford, Conn.
1895..	3	Tremaine, R. C. C., School of Practical Science (Post-graduate course)	Toronto, Ont.
1886..	1	Tyrrell, H. G., C.E.A.M. Can. Soc. C.E.	Berlin Iron Bridge Co., East Berlin, Conn.
1883..	1	Tyrrell, J. W., C.E., D. & O.L.S.	42 James St. N., Hamilton, Ont.
1893..	1	Watson, R. B., Chief Draftsman	Riter & Conley, Allegheny, Pa.
1892.	3	White, A. V., Superintendent	Hyslop, Son, & McBurney Bicycle Works, Toronto, Ont.
1889..	1	Wickett, T., M.D.	
1890..	1	Wiggins, T. H., O.L.S.	Saunders & Wiggins, Civil Engineers and Surveyors, Brockville, Ont.
1890..	1	Withrow, W. J	Fetherstonhaugh & Co., Toronto, Ont.
1888..	1	Wright, C. H. C., B.A. Sc., Lecturer in Architecture, School of Practical Science.	524 Bathurst Street, Toronto, Ont.
1894..	3	Wright, R. T	Boston St. Ry., Co., 32 E. Brooklin St., Boston. Mass.
	6		

UNIVERSITY OF TORONTO.

Degree of C. E.

Date of Admission.	
1895	Bowman, A. M.
1893	Bowman, F. M.
1892	Chewett, H. J.
1893	Innes, W. L.
1886	Kennedy, J. H.
1895	McAllister, J. E.
1885	Morris, J. L.
92	Thomson, T. K.
1894	Tyrrell, H. J.
1889	Tyrrell, J. W.

Degree B. A. Sc.

Date of Admission.	
1893	Alison, T. H.
1894	Ballantyne, H. F.
1895	Beauregard, A. T.
1895	Bucke, W. A.
1894	Chewett, H. J.
1895	Ewart, J. A.
1894	Goodwin, J. B.
1895	Herald, W. J.
1894	James, D. D.
1893	James, O. S.
1895	Job, H. E.
1895	Johnson, S. M.
1895	Johnston, A. C.
1894	Keele, J.
1894	Laidlaw, J. T.
1893	Laing, A. T.
1893	Laschinger, E. J.
1893	Lawson, W.
1893	Lea, W. A.
1894	McAllister, A. L.
1895	McAllister, J. E.

DEGREE OF B. A. SC.—*Continued.*

Date of Admission.	
1893	McAree, J.
1893	McEntee, B.
1894	McPherson, A. J.
1895	McTaggart, A. L.
1894	Merrill, E. B.
1893	Milne, C. G.
1895	Minty, W.
1894	Mitchell, C. H.
1895	Shields, J. D.
1894	Speller, F. N.
1894	Squire, R. H.
1893	Thomson, R. W.
1893	Wright, C. H. C.

SCHOOL OF PRACTICAL SCIENCE, TORONTO.

CALENDAR

OF THE

School of Practical Science

(Affiliated to the University of Toronto.)

OF THE

Province of Ontario.

TORONTO.

20TH SESSION, 1897-1898.

TORONTO:
WARWICK BRO'S & RUTTER,
Printers and Bookbinders,
68 and 70 Front Street West.

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1897.

SEPTEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..
..	..	..	..	..	..	..

24. Meeting of Council.
28. **Entrance Examinations** begin.

OCTOBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	**13**	14	15	16
17	18	19	20	21	22	23
24	25	26	**27**	28	29	30
31	..	..	..	..	..	..

1. **FIRST TERM** begins.
4. Supplemental Examinations begin.
8. Meeting of Council.

NOVEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	**10**	11	12	13
14	15	16	17	18	19	20
21	22	23	**24**	25	26	27
28	29	30	..	..	..	..

12. Meeting of Council.

DECEMBER.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	1	2	3	4
5	6	7	**8**	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	..

10. Meeting of Council,
22. **FIRST TERM** ends.

1898.

JANUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	**12**	13	14	15
16	17	18	19	20	21	22
23	24	25	**26**	27	28	29
30	31	..	..	..	..	..

5. **SECOND TERM** begins.
14. Meeting of Council.

FEBRUARY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	1	**2**	3	4	5
6	7	8	9	10	11	12
13	14	15	**16**	17	18	19
20	21	22	23	24	25	26
27	28	..	..	..	..	..
..	..	..	..	..	..	..

11. Meeting of Council.
23. Ash Wednesday. Buliding closed,

Black figures denote meetings of the Engineering Society.

1898

MARCH.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	1	**2**	3	4	5
6	7	8	9	10	11	12
13	14	15	**16**	17	18	19
20	21	22	23	24	**25**	26
27	28	29	30	31	..	..
..	..	..	..	..	..	..

11. Meeting of Council.

APRIL.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
..	..	..	..	..	..	..

8. Good Friday. Building closed.
9. Lectures and Practical Work close
11. Meeting of Council.
16. **Annual Examinations** begin.

MAY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..
..	..	..	..	..	..	..

1. **SECOND TERM** ends.
10. Examinations for B.A.Sc. begin.

JUNE.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	..	..
..	..	..	..	..	..	..

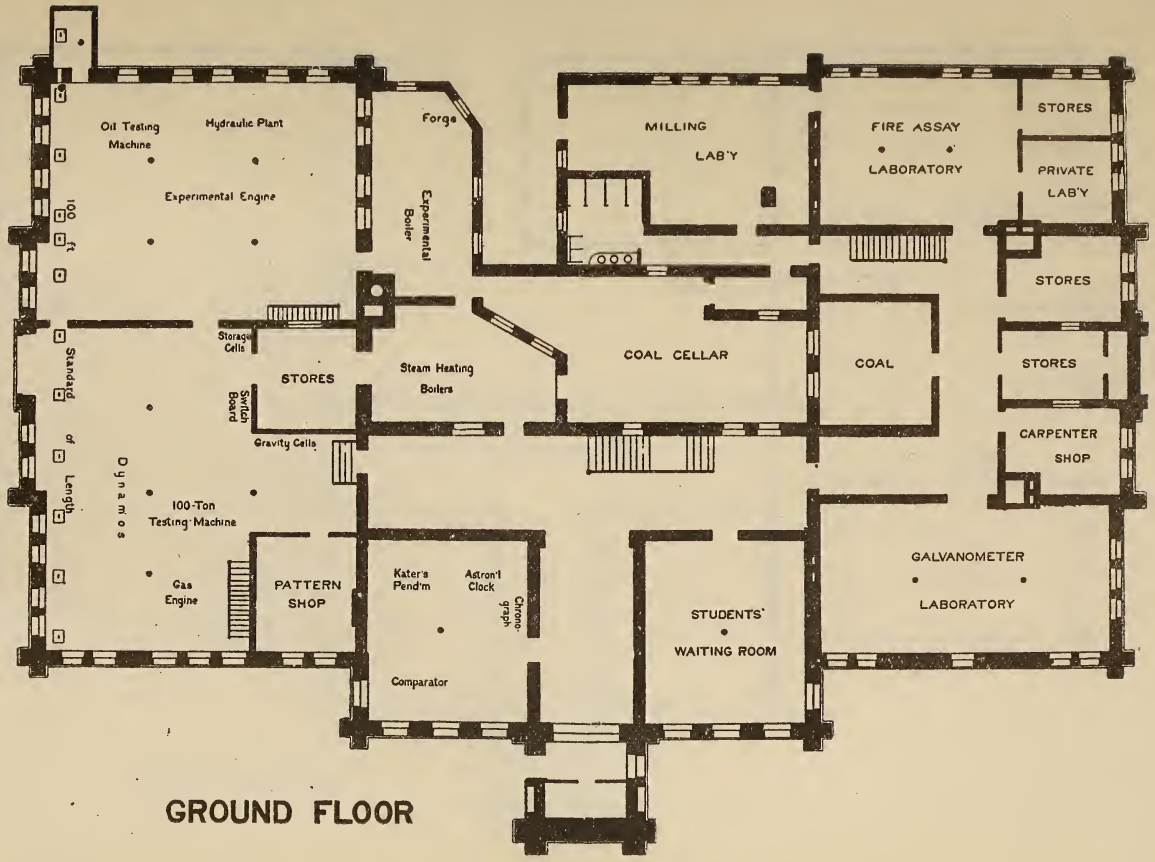
JULY.

SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	..	..	..	.	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	..	..	..	..	..	..

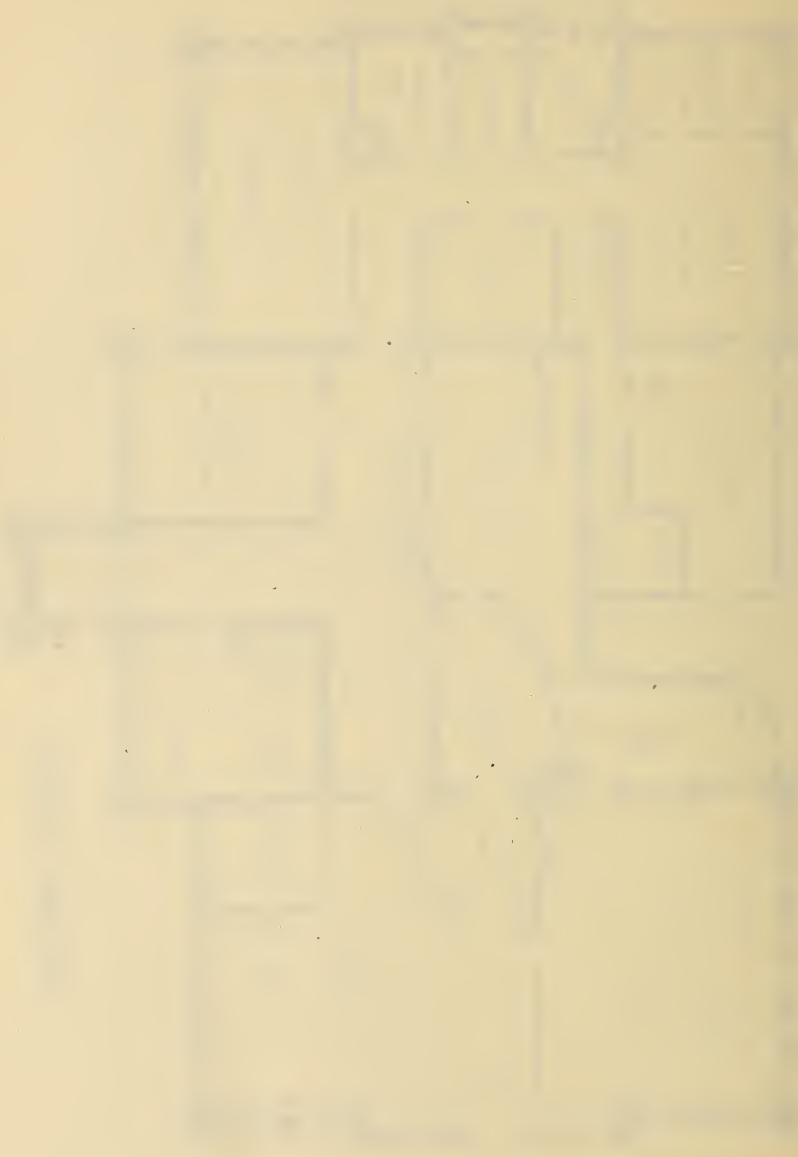
AUGUST.

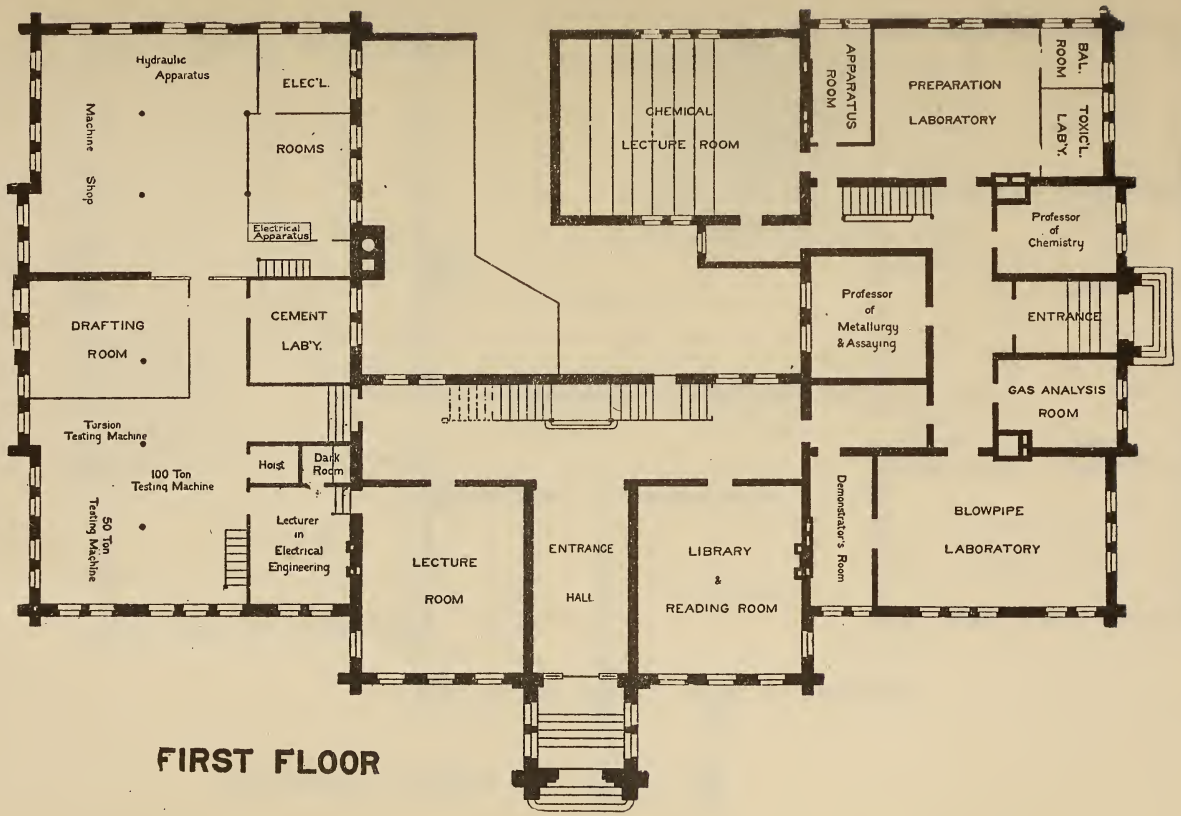
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.
..	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	..	..	..
..	..	..	..	..	..	..

Black figures denote meetings of the Engineering Society.

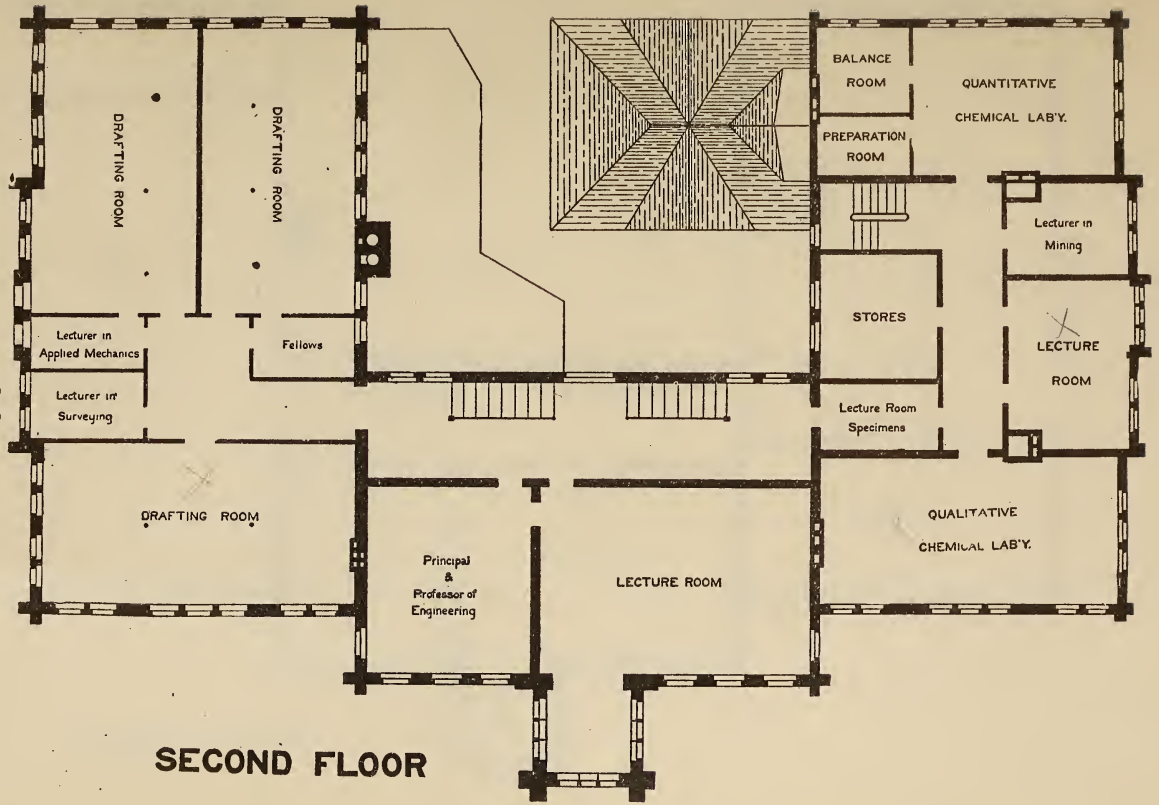


GROUND FLOOR

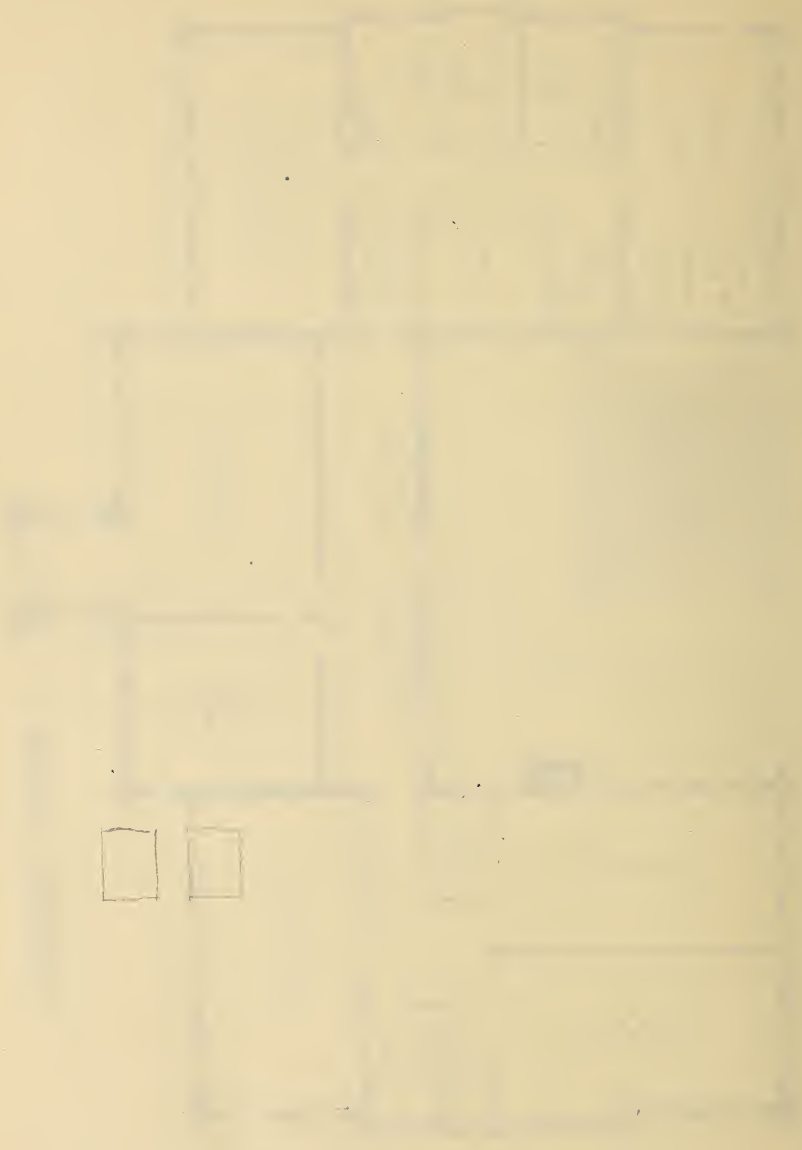


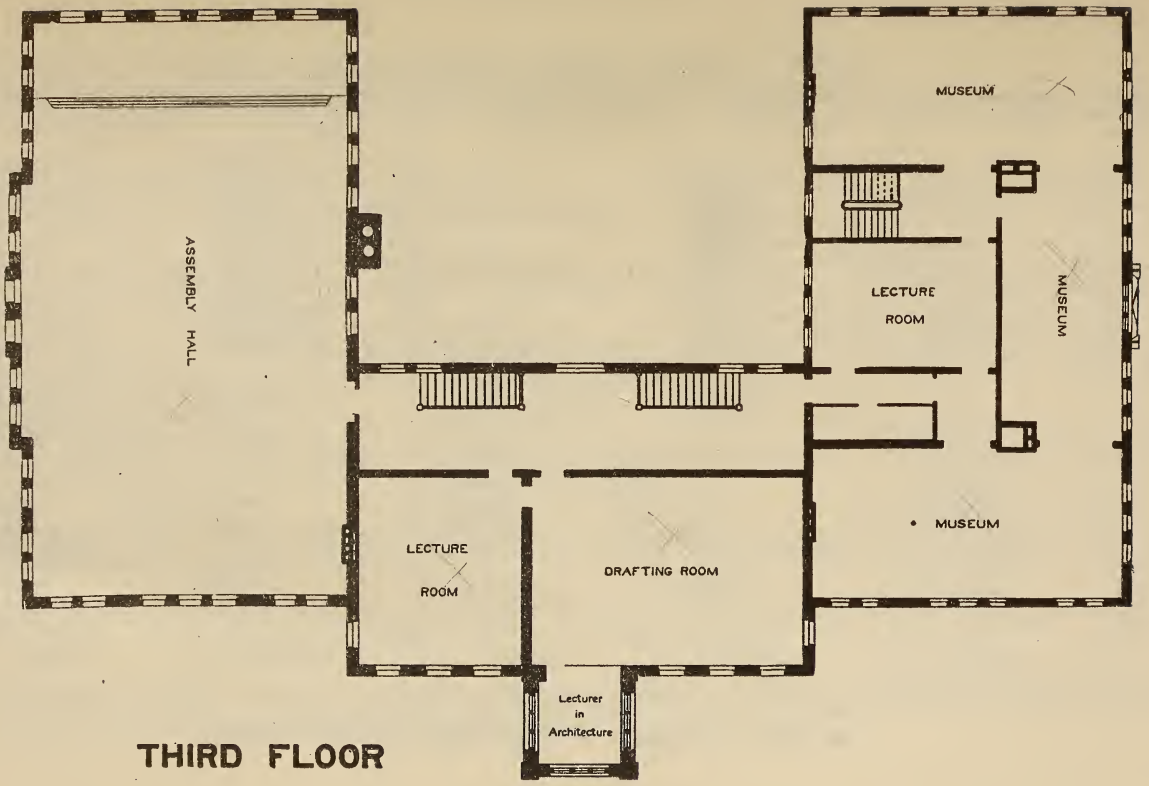

Hydraulic Apparatus
Machine Shop
ELEC'L.
ROOMS
Electrical Apparatus
DRAFTING ROOM
CEMENT LAB'Y.
Torsion Testing Machine
100 Ton Testing Machine
50 Ton Testing Machine
Hoist
Dark Room
Lecturer in Electrical Engineering
LECTURE ROOM
ENTRANCE HALL
LIBRARY & READING ROOM
CHEMICAL LECTURE ROOM
APPARATUS ROOM
PREPARATION LABORATORY
BAL. ROOM
TOXIC'L. LAB'Y.
Professor of Chemistry
ENTRANCE
Professor of Metallurgy & Assaying
GAS ANALYSIS ROOM
Demonstrator's Room
BLOWPIPE LABORATORY

FIRST FLOOR



SECOND FLOOR




ASSEMBLY HALL
MUSEUM
LECTURE ROOM
MUSEUM
LECTURE ROOM
DRAFTING ROOM
MUSEUM
Lecturer in Architecture

THIRD FLOOR

TIME TABLE—FIRST YEAR—SESSION 1897-98.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	
9-10	* Analytical Geometry, 1, 2, 3, 4 Chemical Lab'y, 5	* Euclid.	* Trigonometry.	* Algebra.	* Trigonometry.	9-10
10-11	* Elect'y & Magn'm, 3, 5 (*a*) Drawing, 1, 2, 4 do. 3, 5 (*b*)	Statics, 1, 2, 3, 4 do. 5 (*a*) Drawing, 5 (*b*)	* Acoustics, 4 (*a*) Electricity, 3, 5 (*b*) Drawing, 1, 2 do. 3, 5 (*a*) do. 4 (*b*)	Statics, 1, 2, 3, 4 do. 5 (*a*) Drawing, 5 (*b*)	* Elect'y & Magn'm, 3, 5 (*a*) Electricity, 3, 5 (*b*) History of Arch'e, 4 Drawing, 1, 2	10-11
11-12	Drawing, 1, 2, 3, 4 Chemical Lab'y, 5	Chemistry.	Chemistry.	Chemistry.	Pen and Ink, 4 Drawing, 1, 2, 3, 5	11-12
12-1	Drawing, 1, 2, 3, 4 Chemical Lab'y, 5	Dynamics.	Descriptive Geometry.	Surveying, 1, 2, 3, 4 Drawing, 5	Drawing.	12-1
1-2						1-2
2-3	Chemical Lab'y.	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 3, 5 (*b*) Drawing, 1, 2, 4 (*b*)	Chemical Lab'y, 3, 5 (*a*) Field work, 1, 2, 4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	2-3
3-4	Chemical Lab'y, 3, 5 Drawing, 1, 2, 4	* Physical Lab'y, 5, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (*b*) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 3, 5 (*b*) Drawing, 1, 2, 4 (*b*)	Chemical Lab'y, 3, 5 (*a* Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	3-4
4-5	Chemical Lab'y, 3, 5 Drawing, 1, 2 History of Arch'e, 4	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 5 (b) Drawing, 1, 2, 3, 4 (*b*)	Chemical Lab'y, 1, 2, 4, 5 Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 3, 5 (*b*) Drawing, 1, 2, 4 (*b*)	Chemical Lab'y, 3, 5 (*a*) Field Work, 1, 2, 4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	4-5

1. Civil Engineering; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—SECOND YEAR—SESSION 1897-98.

	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	
9-10	Rigid Dynamics, 1, 2, 5 History of Arch'e, 4	Surveying (Lect) 1, 2, 4 Electricity, 4	* Calculus, 1, 2, 3, 4	* Astronomy, 1 Lithology, 2 (*a*) Electricity, 3 Drawing, 4.—2 (*b*)	* Calculus, 1, 2, 3, 4	9-10
10-11	* Optics, (*b*) Spherical Trig'y, 1, 2, 3 (*a*) Drawing, 4 (*a*)	* Hydrostatics, (*b*) * Heat, 5 (*b*) Metallurgy, (*a*)	Descriptive Geo. 1,2 3,4	* Hydrostatics, (*b*) * Heat, 5 (*b*) Metallurgy, (*a*)	* Optics, (*b*) Spherical Trig'y, 1, 2, 3 (*a*) Drawing, 4 (*a*)	10-11
11-12	* Inorganic Chem'y, 5 Strength of Materials, 1, 2, 3, 4	Chemical Lab'y. Drawing.	Mineralogy and Geology, 1, 2, 4, 5 Theory of Mech'ism, 3	Drawing, 1, 2, 4 Electrical Lab'y, 3	* Inorganic Chem'y, 5 Pen and Ink, 4 Drawing, 1, 2, 3	11-12
12-1	Mineralogy and Geology, 1, 2, 4 Theory of Mech'ism, 3	Chemical Lab'y. Drawing.	Strength of Materials, 1, 2, 3, 4	Drawing, 1, 2, 4 Electrical Lab'y, 3	Drawing, 1, 2, 3, 4	12-1
1-2						1-2
2-3	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing, 4	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Orders of Arch'e, 4 Drawing, 1, 2 do. 3 (*b*)	Applied Chemistry.	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, 2 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 1, 3, 4 (*b*)	2-3
3-4	Mineralogical Lab'y, 1,2 Electrical Lab'y, 3 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y 3, 5 (*a*) Drawing, 1, 2, 4 do. 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, 2 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 1, 3, 4 (*b*)	3-4
4-5	Mineralogical Lab'y, 1,2 Electrical Lab'y, 2 Drawing, 4	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do. 3 (*b*)	* Physical Lab'y, 1, 2, 4 (*b*) Mineralogical Lab'y, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3	* Physical Lab'y, 3, 5 (*a*) Chemical Lab'y, 2 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 1, 3 (*b*) History of Ornament, 4	4-5

1, Civil Engineeaing; 2, Mining Engineering; 3, Mechanical and Electrical Engineering; 4, Architecture; 5, Analytical and Applied Chemistry. *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

TIME TABLE—THIRD YEAR.

SESSION 1897-98.

	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	
9-10	* Biology, 5 Thermodynamics, 1, 2, 3 Drawing, 4	Hydraulics, 1, 2, 3, 4	*Biology, 5 Thermodynamics, 1, 2, 3 History of Arch'e, 4	Hydraulics, 1, 2, 3, 4	*Biology, 5 Compound Stress, 1,3,4 Mining and Ore Dressing, 2	9-10
10-11	Drawing, 1, 2, 3, 4	Astronomy and Geodesy, 1 Electricity, 3 Drawing, 4 Ore Deposits, 2 (*a*) Chemical Lab'y, 2 (*b*)	Mineralogical Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Drawing, 3, 4 do. 1 (*b*)	Astronomy 1 Mechanics of Machinery, 3 Drawing, 4 Ore Deposits, 2 (*a*) Chemical Lab'y, 2 (*b*)	Drawing, 1, 2, 3, 4	10-11
11-12	Drawing, 1, 2, 3 History of Arch'e, 4	Constructive Design, 1, 4 do. 2, 3 (*a*) Drawing, 3 (*b*) Chemical Lab'y, 2 (*b*)	Mineralogical Lab'y, 1, 2, 5 (*a*) Assaying, 2 (*b*) Drawing, 3, 4 do. 1 (*b*)	Constructive Design, 1, 4 do. 2, 3 (*a*) Drawing, 3 (*b*) Chemical Lab'y, 2 (*b*)	Machine Design, 3 Drawing, 1, 2, 4	11-12
12-1	Applied Chemistry.	Mineralogy and Geology, 1, 2, 4, 5 Drawing, 3	Mineral'l Lab'y, 1,2,5 (*a*) Assaying, 2 (*b*) Principles of Dec'n, 4 Machine Design, 3 Drawing, 1 (*b*)	Mineralogy and Geology, 1, 2, 4, 5	Applied Chemistry.	12-1
1-2						1-2

2-3	*Physical Lab'y, 3, 5 (*a*) Drawing, 1, 2, 4 do. 3 (*b*) Plumbing, Heating and Ventilation, 4	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	Descriptive Geometry, 1, 2, 3, 4 (*a*) Theory of Least Squares, 1, 3 (*b*) Chemistry, 2 (*b*)	*Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 (*a*) Metallurgy, 2, 3, 5 (*b*) Drawing, 1, 4 (*b*)	*Physical Lab'y, 3, 5 (*a*) do. 1, 4 (*b*) Field Work, 1, 2, 4 (*a*) Chemical Lab'y, 2 (*b*) Drawing, 3 (*b*)	2-3
3-4	*Physical Lab'y, 3, 5 (*a*) *Organic Chemistry, 5 Drawing, 1, 2, 4 do. 3 (*b*)	*Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 3 do. 4 (*a*) Chemistry, 2 Pen and Ink, 4 (*b*)	*Practical Biology, 5 Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2, (*b*) Drawing, 1, 4 (*b*)	*Physical Lab'y, 3, 5 (*a*) do. 1, 4 (*b*) Chemical Lab'y, 2 (*b*) Organic Chemistry, 5 Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	3-4
4-5	*Physical Lab'y, 3, 5 (*a*) Surveying (Lect.), 1, 2, 4 (*a*) Drawing, 1, 2, 3, 4 (*b*)	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	Drawing, 1, 3, 4 Chemistry, 2	Field Work, 1, 2, 4 (*a*) Electrical Lab'y, 3 Assaying, 2 (*b*) Drawing, 1, 4 (*b*)	*Physical Lab'y, 3, 5 (*a*) do! 1, 4 (*b*) Chemical Eab'y, 2 (*b*) Field Work, 1, 2, 4 (*a*) Drawing, 3 (*b*)	4-5

1. Civil Engineering ; 2. Mining Engineering ; 3. Mechanical and Electrical Engineering ; 4. Architecture ; 5. Analytical and Applied Chemistry ; *University of Toronto. (*a*) First Term. (*b*) Second Term. Subjects not numbered are common to all the departments. In the department of Analytical and Applied Chemistry all hours not otherwise allotted are to be spent in the laboratories.

FOURTH OR POST-GRADUATE YEAR.

There is no regular time table for the work of this year. The time of the students is spent almost wholly in the engineering, chemical and assaying laboratories. The hours are from 9 a.m. to 5 p.m. every working day during the session. Lectures are given at such intervals as suit the laboratory work.

FACULTY OF THE SCHOOL.

J. GALBRAITH, M.A., M. Can. Soc. C.E., Principal.

Members of the Council.

J. Galbraith, M.A., M. Can. Soc. C.E.,
Professor of Engineering (Chairman).

W. Hodgson Ellis, M.A., M.B.,
Professor of Applied Chemistry.

A. P. Coleman, M.A., Ph.D.,
Professor of Assaying and Metallurgy.

L. B. Stewart, O.L.S., D.T.S.,
Lecturer in Surveying (Secretary).

C. H. C. Wright, B.A.Sc.,
Lecturer in Architecture.

T. R. Rosebrugh, M.A.,
Lecturer in Electrical Engineering.

J. A. Duff, B.A., A.M., Can. Soc. C.E.,
Lecturer in Applied Mechanics.

G. R. Mickle, B.A.,
Lecturer in Mining.

Assistant Instructors.

W. E. Boustead, B.A.Sc.,
Acting Demonstrator in Metallurgy and Assaying.

W. Lawson, B.A.Sc.,
Acting Demonstrator in Analytical and Applied Chemistry.

J. Keele, B.A.Sc.,
Fellow in Civil Engineering.

W. Minty, B.A.Sc.,
Fellow in Mechanical Engineering.

Assistant Instructors.—*Continued.*

A. T. Laing, B.A.Sc.,
Fellow in Surveying.

A. E. Blackwood, Grad. S.P.S.,
Fellow in Electrical Engineering.

Members of the Faculty of the University of Toronto whose classes are attended by the Regular Students of the School.

James Loudon, M.A., LL.D.,
President and Professor of Physics.

R. Ramsay Wright, M.A., B.Sc.,
Professor of Biology.

W. H. Pike, M.A., Ph.D.,
Professor of Chemistry.

Alfred Baker, M.A.,
Professor of Mathematics.

A. B. McCallum, B.A., M.B., Ph.D.,
Professor of Physiology.

W. J. Loudon, B.A.,
Demonstrator in Physics.

C. A. Chant, B.A.,
Lecturer in Physics.

J. C. McLennan, B.A.,
Assistant Demonstrator in Physics.

Alfred T. DeLury, B.A.,
Lecturer in Mathematics.

W. L. Miller, B.A., Ph.D.,
Demonstrator in Chemistry.

W. J. Rusk, B.A.,
Fellow in Mathematics.

For information further than that contained in the Calendar, application may be made to the Secretary, L. B. Stewart.

School of Practical Science,

Province of Ontario.

CALENDAR FOR THE SESSION 1897-8.

THE Legislative Assembly during the Session of 1877 gave its sanction to the establishment of a School of Practical Science on the basis proposed in the memorandum of the Minister of Education confirmed by the Lieutenant-Governor in Council on the 3rd day of February, 1877.

By the scheme thus approved of, the Government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School.

This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order-in-Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

There are five regular Departments of Instruction, in each of which Diplomas are granted, viz. :—

1. Civil Engineering (including Sanitary Engineering).
2. Mining Engineering.
3. Mechanical and Electrical Engineering.

4. Architecture.
5. Analytical and Applied Chemistry.

The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also such a training as may make him immediately useful when he commences active professional work.

Diploma.

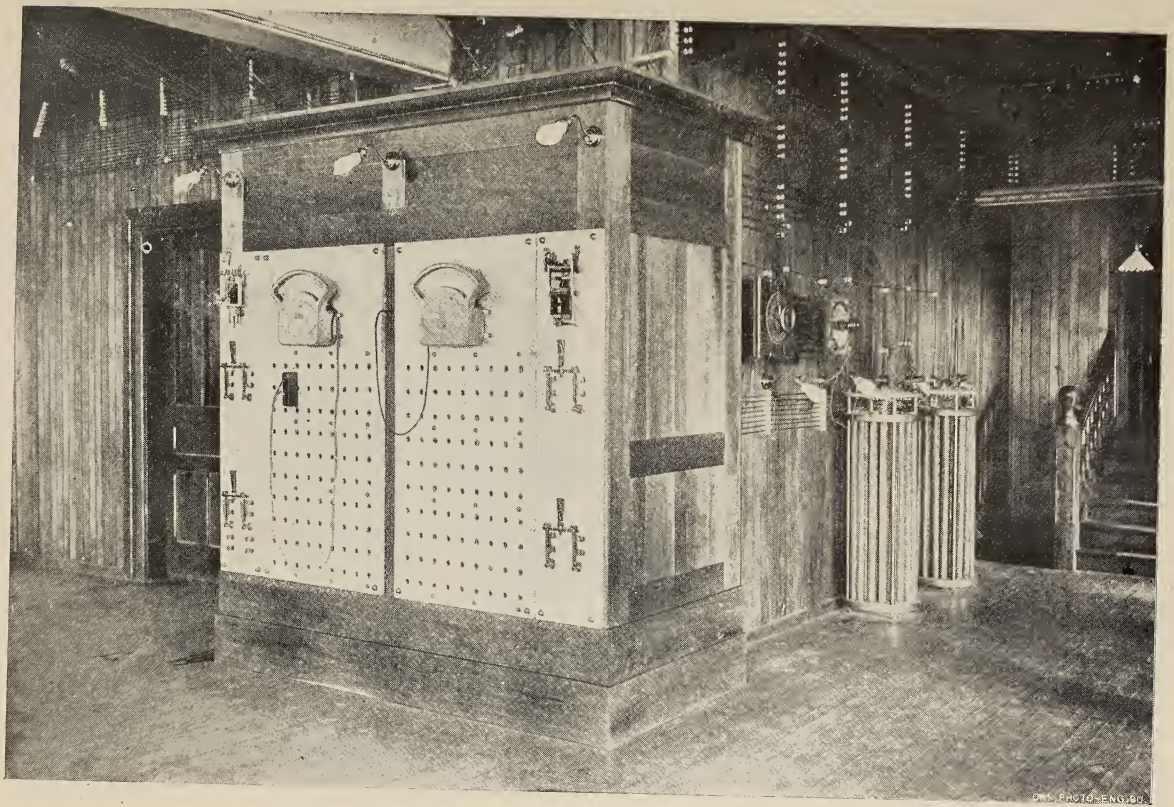
The regular course in each department is of three years' duration, and leads to the Diploma of the School. The instruction is given partly in the lecture rooms and partly in the drafting rooms, laboratories and field. A certain amount of work is laid out for the long vacation. The course of study in each department is general, and beyond the selection of his department the student has no opportunity to specialize.

Degree of B. A. Sc.

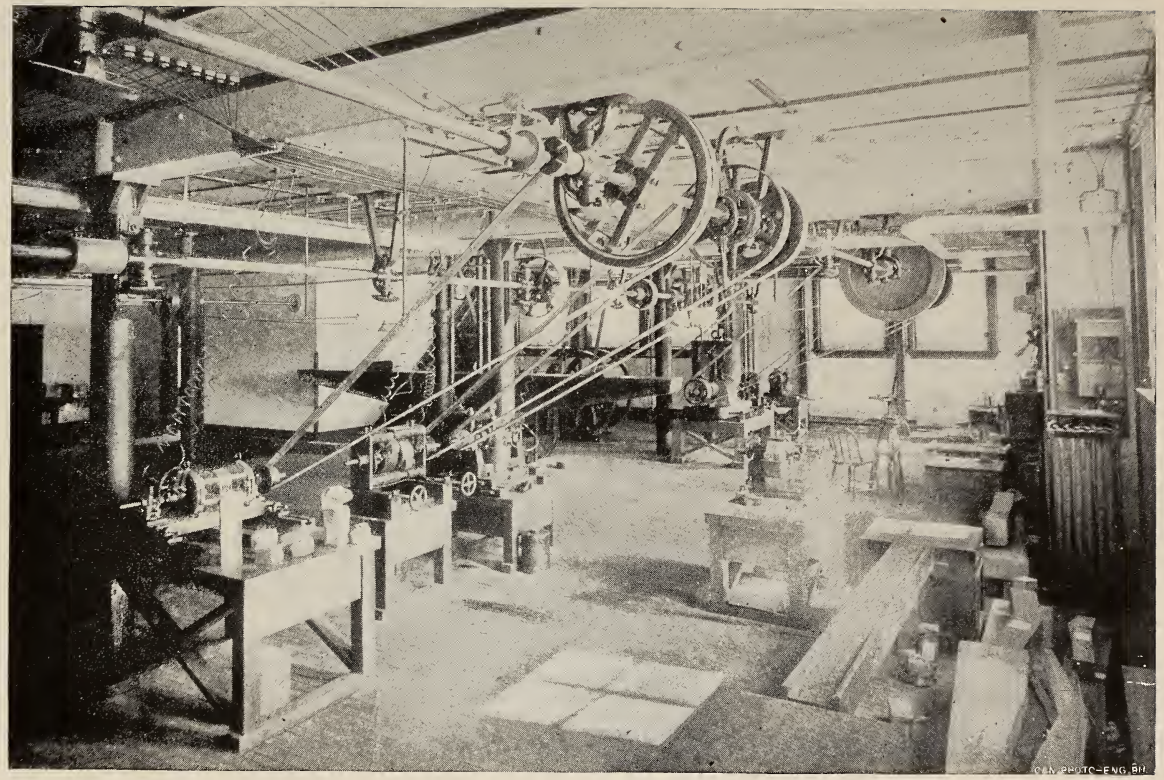
After the general course is finished the Diploma of the School is granted and the student is at liberty either to enter the active life of his profession or to spend another year in special work. This year is called the fourth, or post-graduate, year. Graduates electing to proceed with their studies are allowed to select two subjects from an approved list, and are required to confine their whole attention to these subjects during the fourth year. The subjects on this list are such as require a large amount of time to be devoted to laboratory and other practical work. The advanced theoretical instruction is given either at the beginning or end of the working-day, in order not to break up the time allotted to practical work. During this year the student is required to prepare a Thesis on some subject connected with his work. The practical examinations are held by the School, while the written examinations and the examination of the Theses are held by the University. After complying with all requirements, the candidate receives from the University the degree of Bachelor of Applied Science (B. A. Sc.).

Professional Degrees.

Bachelors of Applied Science may, after three years spent in professional work, present themselves for the degrees of Civil Engineer (C. E.), Mining Engineer (M. E.), Mechanical Engineer (M. E.), or Electrical Engineer (E. E.), as the case may be, subject to the rules and regulations established by the University.



SWITCH-BOARD.



DYNAMO ROOM.

Regulations

RESPECTING THE

School of Practical Science

Approved by Colonel Sir Casimir Stanislaus Gzowski, K.C.M.G., Administrator of the Government of the Province of Ontario, the 30th day of March, 1897.

1. The internal management and discipline of the School of Practical Science shall be vested in a Council (of which the Principal shall be chairman), consisting of the Professors, Lecturers and Demonstrators appointed by the Lieutenant-Governor in Council on the staff of the School.

2. The Academic Year shall extend from October 1st to May 1st, and consist of two Terms, separated by the Christmas Vacation. The date and length of this vacation shall be determined annually by the Council.

3. A Diploma shall be granted to each student who shall have completed to the satisfaction of the Council the Regular Course in any of the following five Departments:

   (1) Civil Engineering (including Sanitary Engineering).

   (2) Mining Engineering.

   (3) Mechanical and Electrical Engineering.

   (4) Architecture.

   (5) Analytical and Applied Chemistry.

4. The Regular Course for the Diploma of the School in each Department shall be three years.

5. Students may enter the Regular Course in any one of the above Departments, either (*a*) by presenting certificates of having passed the Matriculation Examination in any University in

Her Majesty's Dominions, or in all the subjects of such Matriculation Examination except Greek and Latin, or the High School Leaving Examination of the Province of Ontario, or (*b*) by presenting certificates of having had at least one year's experience in some recognized engineering, architectural or manufacturing work or business, and passing an examination in the following subjects :

Arithmetic.—Fundamental rules, metric system, fractions, decimals, powers, square root, mensuration, percentage, interest.

Algebra.—Elementary rules, easy factoring, highest common measure, lowest common multiple, square root, fractions, ratio, simple equations of one, two or three unknown quantities, indices, surds, quadratic equations of one or two unknown quantities.

Euclid.—Books I., II. and III.; deductions.

English.—Dictation, composition.

6. The Council shall have the power of dealing with special cases, provided the candidates are sufficiently prepared to take their places in the classes.

7. Occasional students may be permitted to attend such lectures or courses of instruction, or of practical work, as the Council may think proper, and such students shall not be required to pass an Entrance Examination.

8. At the end of the Academic Year examinations shall be held in the different subjects taught. Candidates for Diplomas are required to enter for these.

9. All regular students shall be in attendance at the school during the whole of each term, unless exempted by special permission of the Council. The term will not be allowed to any student who has attended less than three-fourths of the required lectures and practical lessons, or who has been reported to the Council for bad conduct and adjudged guilty thereof.

10. Students of the School shall attend such courses of lectures at the University of Toronto as may be required of them by the Council.

This is to Certify that

_____

of the _____ *in the* _____

_____ *has completed the Regular Course*

of this School for the Diploma in the _____

_____

extending over a period of three years, and comprising theoretical and practical instruction in the following subjects, Viz:

_____

_____

_____

Wherefore the said _____

becomes duly entitled to receive this Diploma, having fulfilled to the satisfaction of the Faculty of the School all the requirements thereunto relating.

In witness whereof we have signed this Diploma at Toronto, in the Province of Ontario, this _____ *day of* _____ *One thousand eight hundred and* _____

and have caused the Seal of this School to be hereunto affixed

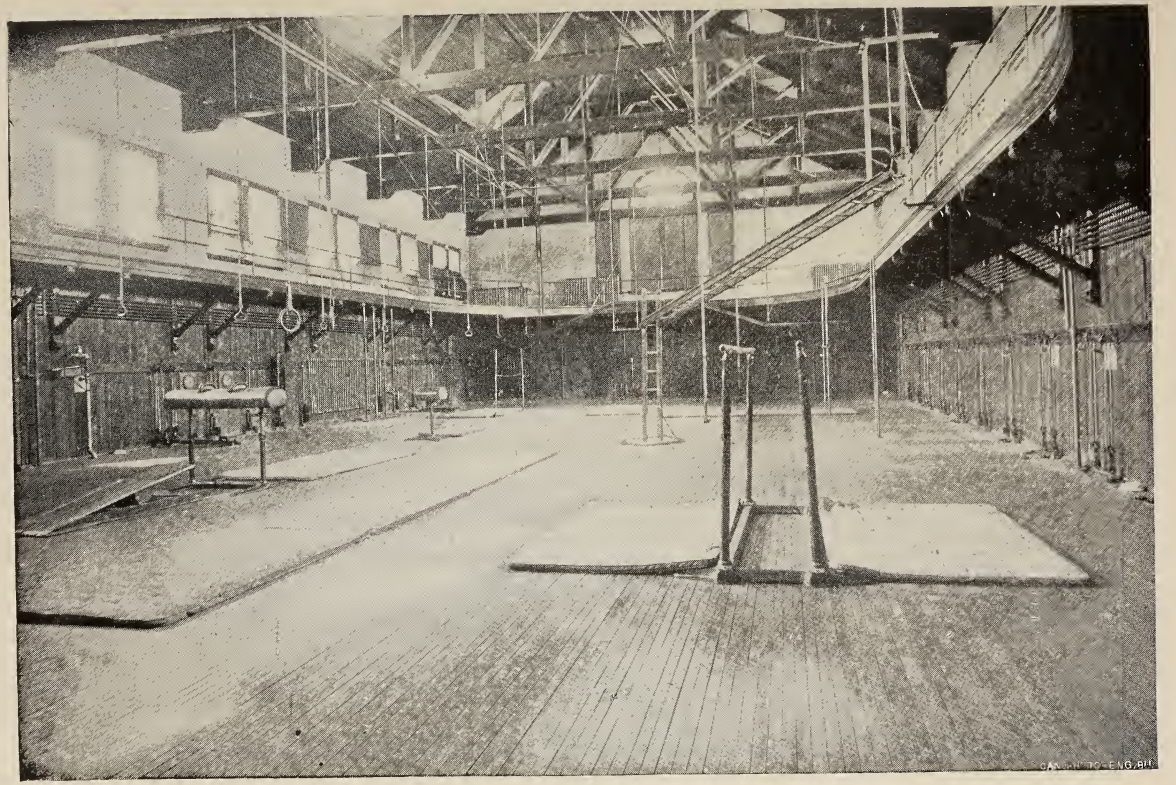
_____

L. S. *Chairman*

_____

Secretary

[FORM OF DIPLOMA.]



GYMNASIUM (University of Toronto).

Admission.

The conditions of admission for regular and occasional students are stated in clauses 5, 6 and 7 of the order in Council, pp. 29 and 30.

For information regarding the conditions for Matriculation in the Universities, application must be made to the Registrars of these Institutions.

Information respecting the High School Leaving Examination may be obtained from the Education Department, Toronto, or from any Principal of a High School or Collegiate Institute.

Students intending to write at the High School Leaving Examination for the purpose of entering the School of Practical Science may do so without having previously passed the Primary Examination. Their papers must be endorsed "For admission to School of Practical Science."

The only examination held in the School of Practical Science for the purpose of testing qualifications for admission is that mentioned in clause 5 (*b*) order in Council, p. 30.

This examination will begin at 9 a.m. Tuesday, September 28th, 1897.

Candidates are required to give the Secretary at least two weeks' notice in writing of their intention to take this examination.

REGULAR COURSES FOR THE DIPLOMA.

See regulations, pp. 29 and 30.

The following are the Departments in which the Diploma is granted :—

(1) Civil Engineering (including Sanitary Engineering).
(2) Mining Engineering.
(3) Mechanical and Electrical Engineering.
(4) Architecture.
(5) Analytical and Applied Chemistry.

Sessional Fees, Dues and Deposits.

These are payable in two instalments, one in each term.

A discount of two dollars will be made on each instalment if paid before the end of the first calendar month of the term in which it is due.

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
		$ c.	$ c.	$ c.	$ c.	$ c.
I.	Payable in First Term—					
	Sessional Fees	22 00	22 00	22 00	22 00	22 00
	Dues—					
	Physical Laboratory	.....	.....	1 00	.....	1 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	.....	.....	.....	.....	.....
		28 00	28 00	29 00	28 00	29 00
	Payable in Second Term—					
	Sessional Fees	22 00	22 00	22 00	22 00	22 00
	Total	50 00	50 00	51 00	50 00	51 00
II.	Payable in First Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Dues—					
	Physical Laboratory	1 50	1 50	1 50	1 00	1 50
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory	3 00	3 00	3 00	3 00	3 00
	Mineralogical Laboratory	3 00	3 00	.....	.....	3 00
		37 50	37 50	34 50	34 00	37 50
	Payable in Second Term—					
	Sessional Fees	27 00	27 00	27 00	27 00	27 00
	Total	64 50	64 50	61 50	61 00	64 50

Year.	Description of Payment.	1. Civil Engineering.	2. Mining Engineering.	3. Mechanical and Electrical Engineering.	4. Architecture.	5. Analytical and Applied Chemistry.
III.	Payable in First Term—					
	Sessional Fees	32 00	32 00	32 00	32 00	32 00
	Dues—					
	Physical Laboratory....	1 00	.....	3 00	2 00	3 00
	Library	1 00	1 00	1 00	1 00	1 00
	Deposits—					
	General	2 00	2 00	2 00	2 00	2 00
	Chemical Laboratory....	.....	3 00	.....	.....	3 00
	Mineralogical Laboratory	3 00	3 00	.....	.....	3 00
		39 00	41 00	38 00	37 00	44 00
	Payable in Second Term—					
	Sessional Fees..... ...	32 00	32 00	32 00	32 00	32 00
	Total.....	71 00	73 00	70 00	69 00	76 00

The total expense of a regular three years' course in any department is about $280, which amount includes books, instruments and materials as well as the fees, etc., stated in above table.

Information as to the text-books, instruments and materials to be purchased by the students will be given on registration at the beginning of the session.

Fourth or Post-Graduate Year.—The fees, etc., in this year are as follows:

Payable in First Term—	
Sessional Fees.....	$30 00
Dues, Library	1 00
Deposits, General.....	2 00
Payable in Second Term—	
Sessional Fees.....	29 00
Total.....	$62 00

Fourth year students must also pay the deposits of the laboratories in which they work.

Occasional Students.—The fees payable by occasional students depend upon the nature and the amount of the work taken; they must be paid within one month from registration. All occasional students are required to pay the library fee, $1, and the general deposit, $2. Those taking laboratory work are required to pay a deposit of $6.

Certificates.—Certificates will be granted to occasional students only in cases in which application has been made to the Council at the beginning of the session and the conditions of award arranged.

Fellowships.

The following fellowships have been established, open to graduates of the school: Civil Engineering, Mechanical Engineering, Electrical Engineering, Surveying, Metallurgy and Assaying, Analytical and Applied Chemistry.

Each fellowship is of the value of $500 per annum.

The Fellows are required to take such portions of the work of instruction as may be assigned to them by the Council.

Applications for these fellowships are to be made annually to the Secretary on or before the 20th day of September.

Regulations Respecting Examinations.

Candidates are required to send to the Secretary at least three weeks before the commencement of the Annual Examinations in April, and the Supplemental Examinations in October, notice in writing of their intention to take such examinations.

This regulation applies to all regular students and to such occasional students as may be candidates for certificates.

No candidate will be allowed to write at the Annual Examinations who has not paid all fees and dues for which he is liable.

The minimum percentage of marks required to pass in the written examinations will be fixed from time to time by the Council.

The minimum percentage of marks required to pass in the practical work connected with any subject, shall be one and one-half times the minimum required in the case of a written examination.

In order to pass in subjects wherein both written and practical examinations are held, the candidate must pass in each examination.

In order to pass the practical examinations in the subjects of Applied Mechanics, Descriptive Geometry, Surveying and Architecture, the following minimum number of drawings must be made in the respective Years and Departments:

Department.	Year.	Applied Mechanics.	Descriptive Geometry.	Surveying.	Architecture.
Civil Engineering	I.	8	7	6	.....
	II.	6	12	4	.....
	III.	8	11	4	.....
Mining Engineering	I.	8	7	6	.....
	II.	5	9	4	.....
	III.	4	8	4	.....
Mechanical and Electrical Engineering	I.	8	7	.....	.....
	II.	12	7	.....	.....
	III.	12	10	.....	.....
Architecture	I.	8	7	2	7
	II.	5	9	.....	9
	III.	6	8	.....	10
Analytical and Applied Chemistry	I.	4	7	.....	.....

The above number of drawings will include only such as shall be specially prescribed for the purpose.

These drawings will be prescribed as the work of the session proceeds.

Drawings prescribed for the first term of the session will not be counted unless finished in that term.

To pass in Drawing the drawings referred to in the preceding table must be made, together with as many others as may be prescribed.

The number of practice sheets to be made by each student will depend upon his progress.

The minimum number of drawings shall be twenty-five and the maximum number thirty-five, except in the Department of Analytical and Applied Chemistry, in which the numbers shall be fifteen and twenty-five respectively.

The minimum percentage of marks prescribed for practical work must be obtained in Drawing.

The drawings must be made on paper 15 x 22 inches, unless otherwise prescribed.

At the end of each term the drawings must be neatly bound together between covers of approved pattern before they are finally examined, and the student's name, together with year, term and date, neatly printed on the cover.

The Council reserve the right of disposing of the drawings as they may think proper. No drawing may be removed from the School without permission.

To pass in Surveying the minimum percentage required for practical work must be obtained in the field work.

No drawings will be counted which have not been made in the drafting rooms, and during the hours allotted to such work.

No field notes will be counted which have not been taken in the field, and during the hours allotted to such work.

Vacation Work.

Vacation work must be handed in on or before October 6th, otherwise it will not be counted.

Vacation notes must be on construction only, and consist of not less than twenty, nor more than thirty pages. The sketches must be free-hand pencil drawings with figured dimensions.

Theses must be written on ordinary foolscap, and consist of not less than twenty, nor more than thirty pages.

The minimum percentage of marks required for practical work must be made in the case of vacation notes and theses.

No notes, whether taken during the session or the vacation, will be counted unless made in the standard note books of the School.

Theses must be accompanied by carefully made drawings and illustrations separated from the text, and be bound between flat covers.

The sketches for the theses in the Architectural Course are to be made on one side of the sheet of a sketch book and mounted on cardboard or paper.

The Architectural students are advised to spend the vacation in architects' offices

Supplemental Examinations, Etc.

A candidate below the standing of the third year, who has failed in one or two subjects, will be required to take supplemental examinations in such subjects.

In case a candidate has failed in both the written examinations and the practical work in a subject, it will be necessary for him to obtain the minimum percentage required for practical work in the written examination, and do such extra practical work during the ensuing session as may be prescribed.

Should his failure have been in only the practical work of a subject, he will be required to take a supplemental written examination, and to do such extra practical work during the ensuing session as may be prescribed. If his failure has been in the written examination only, he will be required to take a written supplemental examination. In each of these cases the minimum percentage required for a written examination will be exacted.

The supplemental written examinations in subjects taught by the staff of the school will begin on the second day of the session. In other subjects they will be held at the time of the annual examinations.

In the case where a candidate fails to pass a supplemental examination it will count as one of the two supplemental examinations which may be allowed him after the next annual examination.

Candidates of the standing of the third year will not be allowed the privilege of a supplemental examination.

Candidates who fail in being promoted to a higher year or in graduating will be required to take again the whole course of instruction, both theoretical and practical, of the year in which they failed, before presenting themselves a second time for examination.

No candidate will be allowed his examination if his written answers or thesis indicate ignorance of the ordinary rules of spelling and composition.

The fees to be paid by a student repeating a year will be the regular fees for such year.

Students are required to spend the hours of every working day between 9 a.m. and 5 p.m. at the work laid down in the time table.

Exemptions.

No exemption from any of the regulations of the School will be granted, unless under such exceptional circumstances as may be deemed sufficient by the Council, which must be fully set forth in a formal petition.

Prizes.

The following prizes have been established :

Architecture, 1st Year, $10 in books. Donor—Mr. D. B. Dick, Architect, Toronto.

Civil Engineering, 3rd Year, $10 in books. Donor—Mr. T. Kennard Thomson, C.E., New York.

Mechanical and Electrical Engineering, 3rd Year, "Digest o Physical Tests." Donor—Mr. F. A. Riehle, Philadelphia.

Honors.

Honors will be granted in each department to the students who pass in all the subjects and obtain at least 66 per cent. of the total number of marks allotted to the department at the annual examinations.

Papers read before the Engineering Society will be considered in granting Honors.

The Honor list will be arranged alphabetically.

Regular Examinations.

(Approximate List)

I Year.

Examinations held at the end of the Session.

Algebra.
Euclid.
Plane Trigonometry.
Analytical Geometry..1, 2, 3, 4.
History of Architecture .....4.
Magnetism and Electricity..3, 5.
Acoustics.....4.
Statics.
Dynamics.
Descriptive Geometry.
Surveying .....1, 2, 3, 4.
Chemistry, Elementary,
Electricity .....3, 5.

Examinations held during the Session.

Drawings.
Field Notes.....1, 2, 4.
Construction Notes..1, 2, 3, 4.
Architectural Sketches.....4.
Experimental Physics ....3, 5.
Practical Chemistry.
French and German .....5.

II. Year.

Examinations held at the end of the Session.

Calculus .....1, 2, 3, 4.
Astronomy .....1.
Optics.
Hydrostatics.
Heat .....5.
History of Architecture .....4.
Orders of Architecture.....4.
History of Ornament .....4.
Chemistry, Inorganic & Physical.5
Chemistry, Applied.
Strength of Materials..1, 2, 3, 4.
Rigid Dynamics .....1, 2, 3.
Theory of Mechanicism .....3.
Descriptive Geometry..1, 2, 3, 4.
Surveying ....1, 2, 4.
Spherical Trigonometry..1, 2, 3.
Mineralogy & Geology.1, 2, 4, 5.
Lithology .....2.
Electricity ..... 3, 5.
Metallurgy.

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1. Civil Engineering.
2. Mining Engineering.
3. Mechanical and Electrical Engineering.
4. Architecture.
5. Analytical and Applied Chemistry.

EXAMINATIONS HELD DURING THE SESSION,

Drawing.....1, 2, 3, 4.
Field Notes .....1, 2.
Construction Notes..1, 2, 3, 4.
Architectural Sketches.....4.
Experimental Physics.
Electricity, Practical 3
Thesis (at beginning of session).
Chemistry, Practical.
Mineralogy, Practical ..1, 2, 5.
French and German .....5.

III. Year.

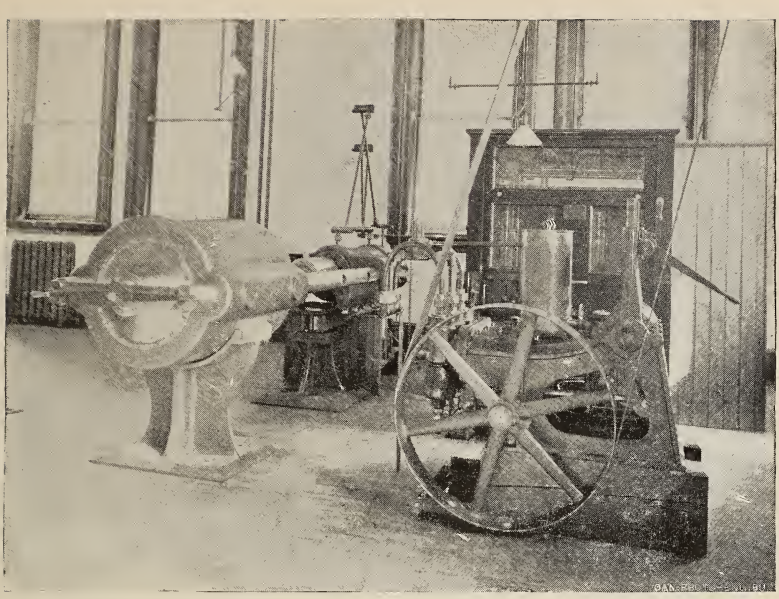
EXAMINATIONS HELD AT THE END OF THE SESSION.

Magnetism and Electricity.3, 5
History of Architecture.....4.
History of Ornament .....4.
Principles of Decoration ....4.
Method of Least Squares..1, 3.
Chemistry, Inorganic and Organic .....5.
Chemistry, Applied.
Mineralogy and Geology, 1,2,4,5
Sanitary Plumbing, Heating and Ventilation .....4.
Theory of Compound Stress, ...1, 3, 4.
Theory of Construction.1, 2, 3, 4
Mechanics of Machinery ....3.
Machine Design.....3.
Hydraulics..... ....1, 2, 3, 4.
Thermodynamics..... 1, 2, 3.
Descriptive Geometry.1, 2, 3, 4
Practical Astronomy and Geodesy..... 1.
Surveying and Levelling..1, 2.
Metallurgy.....2, 3, 5.
Mining and Ore Dressing....2.
Ore Deposits.....2.

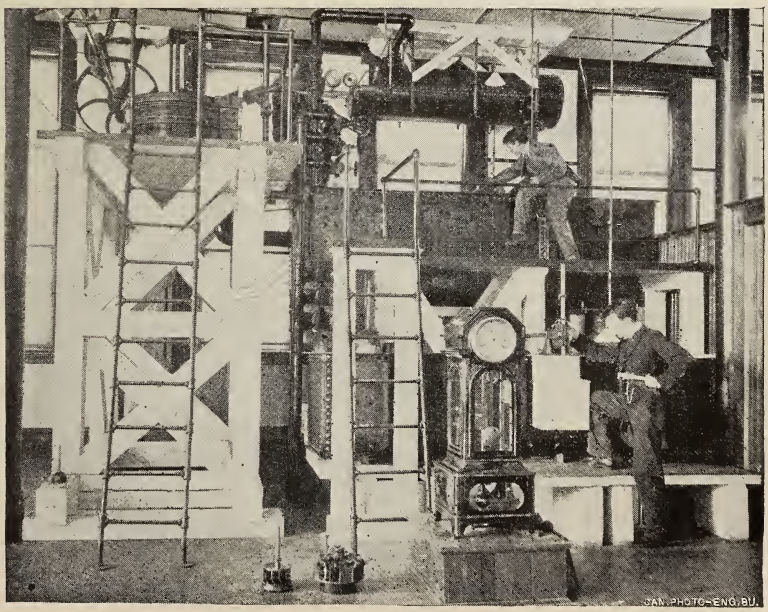
EXAMINATIONS HELD DURING THE SESSION.

Drawings.....1, 2, 3, 4.
Field Notes .....1, 2.
Construction Notes..1, 2, 3, 4.
Architectural Sketches.....4.
Experimental Physics..1, 3, 4, 5.
Electricity, Practical.....3.
Thesis (at beginning of session).
Chemistry, Practical .....2, 5.
Mineralogy, Determinative1, 2, 5.
Assaying.....2, 5.

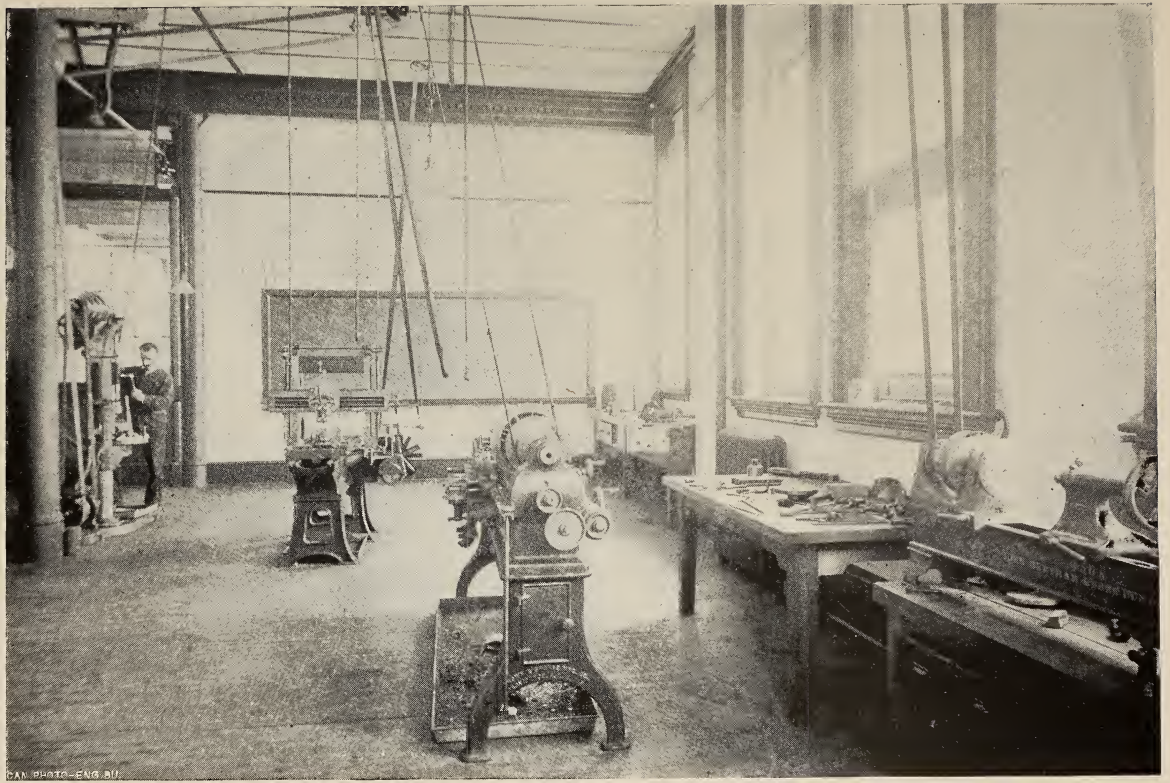
1. Civil Engineering. 3. Mechanical and Electrical Engineering.
2. Mining Engineering. 4. Architecture.
5. Analytical and Applied Chemistry.



EMERY TESTING MACHINE



HYDRAULIC PLANT.



MACHINE SHOP.

Department of Civil Engineering.

(Including Sanitary Engineering.)

This Department is intended to afford the necessary preliminary preparation to students intending to become Civil Engineers (including under this term Sanitary Engineers).

I Year.

Mathematics.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

Drawing.

Copying from the Flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane-sided solids, Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

Chemistry.

General Principles of Chemistry.
Chemistry of the Metals.
Laboratory Practice.

Mechanics.

Statics and Dynamics (with special reference to structures and machines).

Surveying.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit-Theodolite—Plotting, Mensuration.

II Year.

Mathematics.

Differential and Integral Calculus.
Spherical Trigonometry.
Plane Astronomy.

DRAWING.

Subjects of first year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry of the Metals.
Thermo-Chemistry.
Combustion.
Fuels.
Chemical Manufacture.
Laboratory Practice.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied.)
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway Location, Curves, etc.
Hydrographic Surveying.

MINERALOGY AND GEOLOGY.

Elements of these sciences.
Blowpipe practice.
Determination of minerals.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 40 and 93.

III. Year.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
- Shades and shadows.
- Stone cutting.
- Perspective Projection.

Original Designs—Bridges, Roofs, Floors, Arches, etc.

CHEMISTRY (Applied).

Explosives.
Artificial Lighting.
Photography.
Industrial Chemistry.
Sanitary Chemistry.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Practical Designs.
- Bridges, Roofs, Floors.
- Arches, Retaining Walls.
- Foundations, etc.

Thermodynamics and Theory of the Steam Engine.
Hydraulics, Sewerage, Water Supply.
Experimental work in Engineering Laboratory.
Levelling.
Profiles, Cross sections, Field work and Plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.

Trigonometrical and Barometrical Levelling.
Geodesy (considering the earth a sphere).
Practical Astronomy (treated in the manner required for the O.L.S. and D.L.S. Examinations).
Least Squares.

MINERALOGY AND GEOLOGY.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

VACATION WORK

See pages 40 and 93.

II. Department of Mining Engineering.

This Department is designed to afford the necessary preliminary training to students intending to become Mining Engineers.

I. Year.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the Flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane-sided solids. Orthographic (including Isometric) and Oblique Projection.
Original Surveys.

CHEMISTRY.

General Principles of Chemistry.
Chemistry of the Metals.
Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

Field and Office Work—Chain and Compass Surveys—Topography—Preliminary instruction in the use of the Transit Theodolite—Plotting, Mensuration.

II. Year.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

DRAWING.

Subjects of First Year continued.
Coloring and shading applied in both topographical and construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere and principles of map construction.
Machines and structures. (Drawings made from both copies and original notes).

CHEMISTRY.

Chemistry of the Metals.
Thermo-Chemistry.
Fuels.
Chemical Manufacture.
Laboratory Practice.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Experimental work in Engineering Laboratory.
Transit-Theodolite Surveying.
Levelling.
Railway location, curves, etc.
Mining Surveying.

MINERALOGY AND GEOLOGY.

Elements of these sciences.
Blowpipe practice.
Determination of minerals.
Lithology.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

VACATION WORK.

See pages 40 and 93.

III Year.

DRAWING.

Subjects of previous years continued.
Descriptive Geometry.
Shades and shadows.
Stone cutting.
Perspective Projection.
Original Designs—Bridges, Roofs, Floors, etc.

CHEMISTRY (APPLIED).

Explosives.
Artificial Lighting.
Photography.
Industrial Chemistry.
Sanitary Chemistry.
Laboratory Practice.
Wet Assays.

ENGINEERING AND SURVEYING.

Statics and Dynamics (pure and applied).
Strength and Elasticity of Materials.
Theory of Construction.
Thermodynamics and Theory of Steam Engine.
Hydraulics.
Experimental work in Engineering Laboratory.

CLOCK ROOM.

GALVANOMETER LABORATORY.

Levelling.
Profiles, cross-sections, field work and plotting.
Computation of quantities.
Mathematical Theory of Surveying Instruments.
Trigonometrical and Barometrical Levelling.

MINERALOGY AND GEOLOGY.

Economic Geology.
Palæontology.
Ore Deposits.
Blowpipe Analysis and Determinative Mineralogy.
Metallurgy of Gold, Silver, Nickel, Copper, etc.
Mining and Ore Dressing.
Assaying.

VACATION WORK.

See pages 40 and 93.

III. Department of Mechanical and Electrical Engineering.

This Department is intended to afford the necessary preliminary preparation to students intending to become Mechanical and Electrical Engineers.

I Year

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.
Analytical Plane Geometry.

DRAWING.

Copying from the flat. Lettering.
Graphics.
Descriptive Geometry in its application to plane-sided solids.
Orthographic (including Isometric) and Oblique Projection.

CHEMISTRY.

General Principles of Chemistry.
Chemistry of the Metals.
Laboratory Practice.

MECHANICS.

Statics and Dynamics (with special reference to structures and machines).

SURVEYING.

(Lectures only). Applications of Trigonometry and Principles of Measurement.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.

II Year.

MATHEMATICS.

Differential and Integral Calculus.
Spherical Trigonometry.

DRAWING.

Subjects of first year continued.
Coloring and shading applied in construction drawing.
Descriptive Geometry in its application to solids bounded by curved surfaces. The various projections of the sphere.
Machines and structures. (Drawings made from both copies and original notes.)

CHEMISTRY.

Chemistry of the Metals.
Thermo-Chemistry.
Combustion.
Fuels.
Chemical Manufacture.
Laboratory Practice.

ENGINEERING.

Statics and Dynamics (pure and applied).
Theory of Mechanism.
Strength and Elasticity of Materials.
Materials and Construction.
Methods and Processes.
Experimental work in Engineering Laboratory.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Electrical Measurements.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of air: Air Thermometer.

ELECTRICAL LABORATORY.

VACATION WORK.

See pages 40 and 93.

III Year.

DRAWING.

Subjects of previous year continued.
Descriptive Geometry.
Shades and shadows.
Stone cutting.
Perspective Projection.

CHEMISTRY (APPLIED).

Explosives.
Artificial Lighting.
Photography.
Industrial Chemistry.
Sanitary Chemistry.

ENGINEERING.

Subjects of previous years continued.
Applied Mechanics:
Mechanics of Machinery.
Machine Design.
Thermodynamics and Theory of the Steam Engine.
Hydraulics.

Electricity:

Dynamos and motors.

Application of principles to practical problems connected with the design, construction and testing of various prime motors and machines.

Experimental work in Engineering Laboratory.

Least Squares.

METALLURGY.

Gold, Silver, Nickel, Copper, Lead.

EXPERIMENTAL PHYSICS.

Terrestrial Magnetism.

ELECTRICAL LABORATORY.

ORIGINAL DESIGNS.

Engine and Machine Design.

VACATION WORK.

See pages 40 and 93.

In addition to taking the course of instruction in the School and passing the requisite examinations, a candidate for the diploma in Mechanical and Electrical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal trades connected with mechanical work, such as machinist, pattern-maker, moulder, steam engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

IV. Department of Architecture.

This Department is designed to afford the necessary preliminary training to students intending to become Architects.

I Year.

MATHEMATICS.

Eulid, Algebra, Plane Trigonometry.

Plane Analytical Geometry.

DRAWING.

Copying from the Flat. Lettering. Topography.
Graphics.
Descriptive Geometry in its application to plane sided solids, Orthographic (including Isometric) and Oblique Projection.
Rendering in pencil and pen and ink.

CHEMISTRY.

General Principles of Chemistry.
Chemistry of the Metals.
Laboratory Practice.

MECHANICS.

Statics (with reference to structures).
Dynamics (preliminary to the study of hydraulics).

SURVEYING.

Principles, Chain Surveying, Mensuration.

PHYSICS.

Acoustics.

HISTORY OF ARCHITECTURE.

General introduction.
Ancient Architecture.
Egyptian, Assyrian and Persian.

II. Year.

MATHEMATICS.

Differential and Integral Calculus.

DRAWING.

Instrumental Drawing, Drawing from the Cast, sketching and Water Color, Pen and Ink.
Descriptive Geometry (curved surfaces).

CHEMISTRY.

Chemistry of the Metals.
Thermo Chemistry.
Combustion.
Fuels.
Chemical Manufacture.
Laboratory Practice.

MECHANICS.

Statics (pure and applied).
Strength and Elasticity of Materials.
Materials of Construction.
Experimental work in Engineering Laboratory.

SURVEYING.

Use of transit and level.
Mensuration.

MINERALOGY AND GEOLOGY.

Elements.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.

EXPERIMENTAL PHYSICS.

Light : use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat.
Acoustics : laws of vibrating strings.
Determination of pitch.
Velocity of sound.
Electric fork.
Chronograph.

HISTORY OF ARCHITECTURE.

Greek and Roman.
Romanesque and Byzantine.

ORDERS AND ELEMENTS OF ARCHITECTURE

HISTORY OF ORNAMENT.

Ancient.
Classic—Greek, Roman.

VACATION WORK.

See pages 40 and 93.

III. Year.

DRAWING.

Descriptive Geometry.
Shades and shadows.
Stone cutting.
Perspective Projection.
Water Color sketching.
Original Designs—Floors, Trusses, Arches, etc.

CHEMISTRY (APPLIED).

Explosives.
Artificial Lighting.
Photography.
Industrial Chemistry.
Sanitary Chemistry.

THEORY OF CONSTRUCTION.

Experimental work in Engineering Laboratory.

HYDRAULICS.

SANITARY SCIENCE.

House Drainage and Plumbing.
Ventilation and Heating.

SURVEYING.

Levelling, Setting out Excavation, Mensuration.

MINERALOGY AND GEOLOGY.

Economic Geology.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

HISTORY OF ARCHITECTURE.

Gothic and Renaissance, with special reference to England.

HISTORY OF ORNAMENT.

Early Christian; Gothic and Renaissance.

PRINCIPLES OF DECORATION

VACATION WORK.

See pages 40 and 93

V Department of Analytical and Applied Chemistry.

This Department is designed to afford the necessary preliminary training to students who intend to become chemists by profession, either as analytical chemists or industrial chemists.

I. Year.

MATHEMATICS.

Euclid, Algebra, Plane Trigonometry.

DRAWING.

Copying from the flat. Lettering.
Descriptive Geometry in its application to plane sided solids.
Orthographic (including Isometric) and Oblique Projection.
Model Drawing.

CHEMISTRY.

General Principles of Chemistry.
Chemistry of the Metals.
Laboratory Practice.

MECHANICS.

Statics and Dynamics.

PHYSICS.

Magnetism and Electricity.

EXPERIMENTAL PHYSICS.

Light: Use of lenses and mirrors.
Calculation of focal lengths.
The prism and spectroscope.
Goniometer and heliostat

MODERN LANGUAGES.

French.
German.

II. Year.

CHEMISTRY.

Inorganic and Physical Chemistry.
Applied Chemistry.
Laboratory work in Quantitative and Qualitative Analysis

CHEMICAL LABORATORY—QUALITATIVE ANALYSIS.

CHEMICAL LABORATORY.—QUANTITATIVE ANALYSIS.

MINERALOGY AND GEOLOGY.

Elementary Mineralogy and Blowpipe Practice.
Physical Geography, Palæontology and Geology.

METALLURGY.

Iron and Steel.

PHYSICS.

Hydrostatics.
Optics.
Heat.
Electricity.

EXPERIMENTAL PHYSICS.

Heat: Specific Heat; Latent Heat.
Expansion of Air; Air Thermometer.

ELECTRICAL LABORATORY.

MODERN LANGUAGES.

Students in this and the following years are expected to be able to read chemical books in French and German.

VACATION WORK.

See pages 40 and 93.

III. Year.

CHEMISTRY.

Organic Chemistry and Chemical Physics.
Applied Chemistry.
Laboratory work.

MINERALOGY AND GEOLOGY.

Economic Geology.
Blowpipe Analysis and Determinative Mineralogy.

METALLURGY.

Gold, Silver, Nickel, Copper, Lead.

EXPERIMENTAL PHYSICS.

BIOLOGY.

VACATION WORK.

See pages 40 and 93.

The Fourth Year.

After the completion of the general three years' course in any department, students are recommended to take up the special work of the fourth year, leading to the degree of Bachelor of Applied Science in the University of Toronto. It is only by so doing that full advantage can be taken of the laboratory equipment of the School. The fourth year enables students to continue under certain restrictions the study of subjects in which they take special interest and is the means adopted in the School of Practical Science of affording them the advantage of optional and special studies.

To be admitted to the fourth year a candidate must be a graduate of the School of Practical Science or an undergraduate of the standing of the fourth year in the University of Toronto in the Honor Department of Chemistry and Mineralogy.

The subjects of study in the fourth year are arranged in the following groups and subdivisions :

A. { Astronomy
Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materials.
Hydraulics.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

Each student will be required to confine his studies during the session to one of the above groups. He will not be allowed to take less than two nor more than three of the subdivisions in any group.

The subdivision "Inorganic and Organic Chemistry" will be obligatory on all students who select group C.

A student is liable to be called on to assist in any of the experimental and practical work in the group which he has selected, although it may not belong to his special subjects.

Candidates are required to notify the Secretary in writing of their intention to take the fourth year work at least one week before the opening of the session, and to inform him at the same time of the subjects which they propose to take. These subjects will be submitted to the Council for approval at the beginning of the session, and no student will be permitted to take any subject not so approved.

Undergraduates of the University of Toronto of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy may be admitted as students in the fourth year in the groups C and D.

Candidates will be required to show a good working acquaintance with translation from either French or German. This will be tested by their ability to translate extracts from scientific works or periodicals not previously specified.

Pass and Honors.

Total marks assigned to fourth year 900

Subdivided as follows :—

Work (reckoned in hours)..... 540 marks
Records (notes, drawings, etc.)..... 360 "

For Pass.

The minimum percentages are :

Work, 75 per cent..... 405 marks
Records, 50 " ..... 180 "
And two-thirds of the total marks assigned. 600 "

For Honors.

In deciding the allotment of honors the whole academic record of the candidate will be taken into consideration, but no honors will be granted unless the candidate shall have received a special recommendation from the member or members of Council under whose supervision his fourth year work has been done.

Honors granted will be mentioned in the certificate required under clause 2 of the statute of the University of Toronto respecting the degree of B. A. Sc.

The above certificate will not be granted to students who have been absent without leave of the Council from more than ten per cent. of the lectures and practical work of either term of the session.

Courses of reading will be indicated in connection with subjects of study.

The above regulations have been approved by the Senate of the University of Toronto in so far as they affect the degree of B. A. Sc.

Degree of B. A. Sc.

Candidates who have fulfilled the requirements of the Fourth Year in the School of Practical Science are eligible for the degree of Bachelor of Applied Science in the University of Toronto in accordance with a statute passed by the Senate in 1892, which, with the amendments since made, is as follows :

By the Senate of the University of Toronto.

Be it enacted :

That the Degree of Bachelor of Applied Science (B. A. Sc.) be hereby established to be granted subject to the following conditions and regulations :

1. Candidates for the said degree shall hold the diploma of the School of Practical Science in any one of the regular courses of the said School, or shall be of the standing of the fourth year in the Honor Department of Chemistry and Mineralogy in the University of Toronto.
2. They shall have fulfilled the conditions relating to the Fourth or Post-Graduate year in the School of Practical Science, and shall present certificates of having done so to the Registrar of the University. Honors may be granted with such certificates by the Faculty of the School.
3. Each candidate shall prepare a Thesis based on the results of his Fourth Year work in the said School of Practical Science for the approval of the University examiners. This Thesis is to be accompanied by all necessary drawings, specifications, tables and estimates. To pass in the Thesis a candidate must obtain fifty per cent., and to take honors seventy-five per cent., of the marks assigned.
4. Candidates will be required to select two sub-divisions in any one of the following groups, and to pass such written and oral examinations on the subjects selected as may be prescribed by the University examiners.

   A. { Astronomy.
      { Geodesy and Metrology.

B. { Architecture.
Strength and Elasticity of Materals.
Hydraulic.
Thermodynamics and Theory of Heat Engines.
Electricity and Magnetism.

C. { Industrial Chemistry.
Sanitary and Forensic Chemistry.
Inorganic and Organic Chemistry.

D. { Mineralogy and Geology.
Metallurgy and Assaying.

The sub-division "Inorganic and Organic Chemistry" will be obligatory on all candidates who select group C.

To pass in each subject thirty-three per cent., and to take honors sixty-six per cent. of the marks assigned, will be required.

. The degree with honors will be conferred on candidates who obtain three out of the four honors possible.

Viz.--Certificate with honors .....(cl. 2.)
Thesis with honors.....(cl. 3.)
Honors in each subject of examination (cl. 4.)

. Candidates are required to send to the Registrar of the University at least three weeks before the commencement of the annual examinations an application for examination according to a printed form to be obtained from the Registrar, and such application must be accompanied by a fee of ten dollars.

7. The examination for the degree shall be held in May.

8. The fee for the degree shall be ten dollars and shall be paid to the Registrar not later than the first day of May.

9. The ordinary time for conferring the degrees shall be at the University commencement in June. The degrees may be conferred at any meeting of the Senate.

10. The Thesis, drawings, and other papers accompanying them, shall be the property of the University.

11. In case any change be made in the conditions referred to in the second clause, such change shall be submitted to the Senate and shall have no force so far as the said clause is concerned unless approved by resolution of the Senate.

Subsequent Professional Degrees.

The attention of graduates is directed to the following statute, passed by the Senate of the University of Toronto in 1896 :

By the Senate of the University of Toronto.

Be it enacted :

I. That all previous Statutes of the University relating to degrees or diplomas in Engineering be repealed.

II. That the following degrees be hereby established, viz., Civil Engineer (C. E.), Mining Engineer (M. E.), Mechanical Engineer (M. E.), Electrical Engineer (E E.).

III. That the following be the conditions and regulations governing the conferring of the said degrees :

1. A candidate for one of the said degrees shall hold the diploma of the School of Practical Science and the degree of Bachelor of Applied Science of the University of Toronto, except in the case provided for in clause 11 hereunder.

2. He shall have spent at least three years after receiving the degree of Bachelor of Applied Scienee in the actual practice of the branch of Engineering wherein he is a candidate for a degree.

3. Intervals of non-employment or of employment in other branches of Engineering shall not be included in the above three years. It shall not be necessary that the several periods requisite to make up the said three years be consecutive.

4. Satisfactory evidence shall be submitted to the University Examiners as to the nature and length of the candidate's professional experience for the purposes of clauses 2 and 3. The Examiners shall satisfy themselves by oral or written examinations in regard to the candidate's experience and competence.

5. The candidate shall prepare an original Thesis on some engineering subject in the branch in which he wishes a degree ; the said Thesis to be accompanied by all necessary descriptions, details, drawings, bills of quantities, specifications, and estimates.

The candidate may be required at the option of the Examiners to undergo an examination in the subject of this Thesis.

6. Notice in writing shall be sent to the Registrar not later than the first day of February, informing him of the degree to which the candidate wishes to proceed and of the title of his proposed Thesis, for the approval of the Senate.

7. The evidence under clause 4, and the Thesis, with accompanying papers, described in clause 5, shall be sent to the Registrar not later than the first day of May.

8. The candidate shall be required to present himself for examination in the month of May at such times as may be arranged by the Registrar.

9. The fee for any one of the said degrees shall be twenty dollars, and shall be paid to the Registrar not later than the first day of May.

10. The Thesis, drawings and other papers submitted under clause 7 shall become the property of the University.

11. Candidates who graduated from the School of Practical Science before June, 1895, shall not be required to hold the degree of Bachelor of Applied Science.

For further information apply to the Registrar of the University of Toronto.

Dominion and Ontario Land Surveyors.

Courses of instruction will be given in accordance with the requirements of the Statutes relating to the Dominion and Ontario Land Surveyors, which will enable the graduates to present themselves for final examination before the proper Boards, at an earlier period in their apprenticeship than would otherwise be permitted.

Extracts from the Provincial Act respecting Land Surveyors and Survey of Lands. (Cap. 152, R.S.O.)

"10.—(2) Any person serving as an apprentice as hereinbefore provided, may, with the permission of the Board of Examiners, attend the Ontario School of Practical Science, or any school, college, or university, the course of study in which is in the opinion of the Board sufficiently similar to that in the Ontario School of Practical Science, for the purpose of taking any course of study which includes any subjects required for the final examination for admission to practice as a land surveyor, but the total period of such apprenticeship and of such course of study shall not

exceed the period of four years from the date of the articles of apprenticeship as above mentioned, and not less than three years of the said period of four years shall be passed in the actual service of a practising Ontario Land Surveyor."

"14. The privilege of a shorter term of apprenticeship shall also be accorded to any graduate of the Royal Military College at Kingston and of the Ontario School of Practical Science in civil or mining engineering, or of the McGill College, Montreal, in civil or mining engineering, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be required to serve under articles with a practising land surveyor duly filed as required by section 17 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination by this Act prescribed.

"(2) Such person at any time during his apprenticeship may with the permission of the Board of Examiners, attend the Ontario School of Practical Science, or any school, college, or university, the course of study in which is in the opinion of the Board, sufficiently similar to that in the Ontario School of Practical Science, for the purpose of taking any course of study which includes any subjects required for the final examination for admission to practice as a land surveyor, but the total period of such apprenticeship, and of such course of study, shall not exceed the period of two years from the date of the articles of apprenticeship as above mentioned, and not less than twelve months of the said period of two years shall be passed in the actual service of a practising Ontario Land Surveyor."

Extract from the Dominion Lands Act.

"Every graduate in surveying of the Royal Military College of Canada, and every person who has followed a regular course of study in all branches of education required by this Act for admission as a Dominion Land Surveyor, through the regular sessions, for at least two years in any College or University where a complete course of theoretical and practical instruction in surveying is organized, and who has thereupon received from such College or University a Diploma as Civil Engineer, shall be exempt from serving three years as aforesaid, and shall be entitled to examination after one

year's service under articles with a Dominion Land Surveyor, at least six months of which service has been in the field, on producing the affidavit required by the next preceding clause as to such service; but it shall rest with the Board to decide whether the course of instruction in such College or University is that required by this clause.

The attention of the Candidates for the Diploma of D. T. S., given by the Dominion Board of Examiners, is directed to the facilities afforded for preparation in the School.

Extracts from the Ontario Architects' Act.

"21. Any student who has matriculated in Arts in any University in Her Majesty's dominions, or in the Ontario School of Practical Science, shall not be required to pass the preliminary examinations.

"23. Any person who applies for admission to registration as an architect after the coming into force of this Act, shall be not less than twenty-one years of age, shall have served as a student not less than five years with a principal or principals entitled to register under this Act, or with any other principal or principals approved by the council, and have passed such qualifying examinations as may be required by this Act.

"24.—(3) Any person who has graduated from the Ontario School of Practical Science shall be required to serve only three years as a student, one of which three years may be served during the vacation of such school.

"(4) Upon and after the passing of this Act, students shall serve such term as is required to be served by the provisions of this Act, under indenture, to a registered architect, which indenture and any assignment thereof with affidavit of execution thereto attached shall be filed with the Registrar upon payment of such fees as the council may, by regulation, direct."

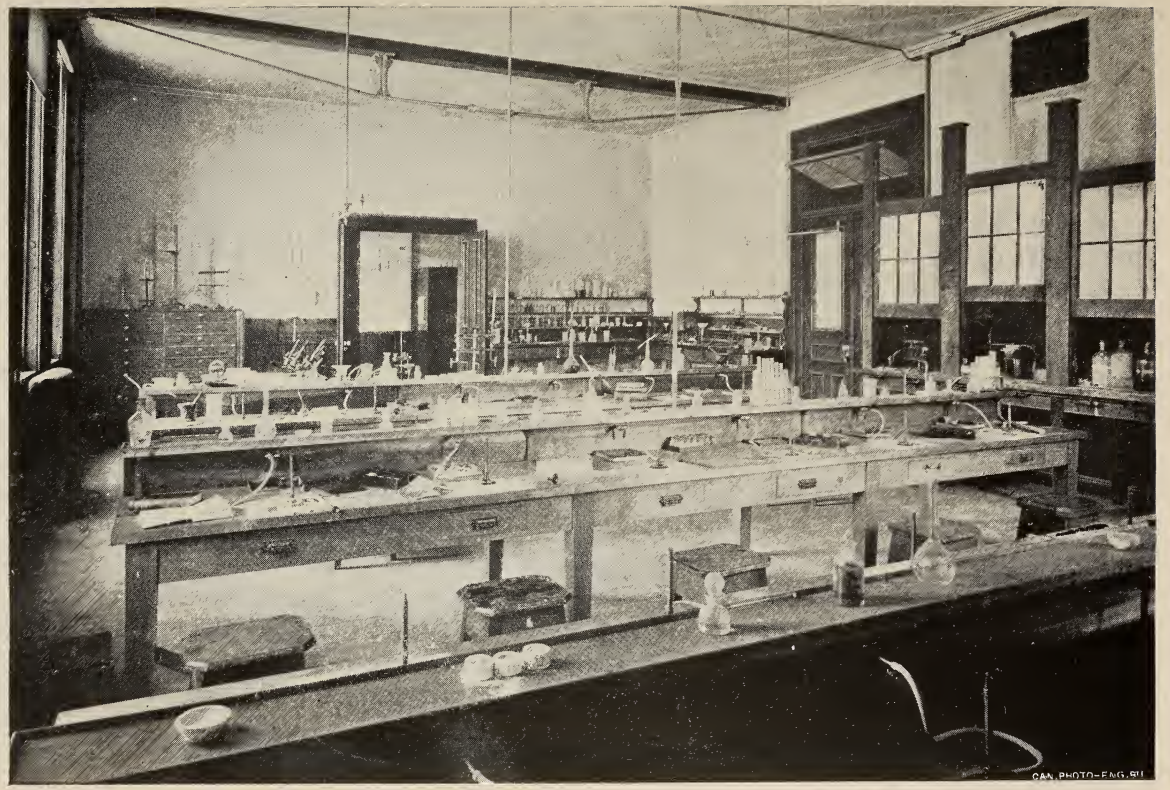
SYNOPSIS OF THE COURSES OF LECTURES

AND PRACTICAL INSTRUCTION.

Text-books for the first year marked (*a*); second year (*b*); third year (*c*) and for fourth or post graduate year (*d*).

Subjects Taught by the Faculty of the School.

Subjects.	Instructors.
Organic and Inorganic Chemistry. Applied Chemistry.	W. H. Ellis, M.A., M.B., Professor. W. Lawson, B.A Sc., Acting Demonstrator.
Mineralogy and Geology. Petrography. Metallurgy and Assaying, Mining and Ore-dressing, Milling, German.	A. P. Coleman, M.A., Ph. D., Professor. G. R. Mickle, B.A., Lecturer. W. E. Boustead, B A.Sc., Acting Demonstrator.
Statics, Dynamics, Strength of Materials, Theory of Construction. Compound Stress, Hydraulics, Thermodynamics and Theory of the Steam Engine. French.	J. Galbraith, M.A., Professor. J. A. Duff, B.A., Lecturer. W. Minty, B.A.Sc., Fellow.
Drawing, Architecture, Plumbing, Heating and Ventilation, Mortars and Cements, Brick and Stone Masonry.	C. H C. Wright, B.A.Sc., Lecturer. Jos. Keele B.A.Sc, Fellow.
Surveying, Geodesy and Astronomy. Spherical Trigonometry, Least Squares. Descriptive Geometry.	L. B. Stewart, D.T.S., Lecturer. A. T. Laing, B.A.Sc., Fellow.
Electricity, Magnetism, Machine Design, Mechanics of Machinery, Rigid Dynamics.	T. R. Rosebrugh, M.A., Lecturer. A. E. Blackwood, Grad. S.P.S., Fellow.



BLOWPIPE LABORATORY.

MINERALOGICAL COLLECTION.

Subjects Taught by the University Professoriate.

Algebra, Euclid, Plane Trigonometry, Analytical Geometry, Calculus, Astronomy.	Alfred Baker, M.A , Professor. A. T. DeLury, B.A., Lecturer. W. J. Rusk, B.A., Fellow.
Sound, Light, Heat, Electricity and Magnetism. Hydrostatics.	Jas. Loudon, M.A., LL.D., Professor. W. J. Loudon, B.A., Demonstrator. C. A. Chant, B.A., Lecturer. J. C. McLennan, B.A., Assistant Demonstrator.
Inorganic and Organic Chemistry, Physical Chemistry.	W. H. Pike, M.A., Ph.D. Professor. W. H. Miller B.A., Ph.D , Demonstrator.

Drawing.

Model Drawing, Machines and Structures, Map and Topographical Drawing, Designs and Estimates, Graphical Calculations.

Descriptive Geometry, including Practical Geometry (Plane and Solid); Orthographic, Oblique and Perspective Projections; Intersections of Surfaces, Shades and Shadows, Stone Cutting, Theory of Mechanism, Theory of Mapping, etc.

Text-Books and Books of Reference.

Davidson—Projections.
Angel—Plane and Solid Geometry.
Binn—Orthographic Projection.
Millar—Descriptive Geometry, (*a*), (*b*).
Warren—Stone Cutting (*c*).
MacCord—Lessons in Mechanical Drawing.
Worthen—Topographical Drawing.
Vere Foster—Copy Book No. 10, (*a*).
Reinhardt—Lettering for Draftsmen, Engineers and Students, (*b*), (*c*).

Surveying and Levelling.

Land Surveying.

Chain Surveys.
Compass and Theodolite Surveys.
Method of keeping Field Notes.
Determination of Heights and Distances.
Plotting.

Levelling.

Longitudinal and Cross Sections.
Plotting.

Setting Out.

Setting out Straight Lines and Curves.
Setting out Levels.

Mensuration.

Lines, Surfaces and Solids.
Timber, Masonry, Iron and Earthwork.
Capacity of Reservoirs, etc.

Lectures are also given on the distinctive features of Mining and Hydrographic Surveying.

Text-books.

Murray—Manual of Land Surveying (*a*).
Gillespie—Higher Surveying (*b*), (*c*), (*d*).
Henck or Trautwine—Railway Curves (*b*), (*c*).
Johnson—Theory and Practice of Surveying.
Brough—Mine Surveying (*b*), (*c*).

Practical Astronomy and Geodesy.

Ordinary Course

The work included in this course is sufficient to fulfil the requirements of the final examination for Provincial and Dominion land surveyors.

In astronomy the principal subjects are the determination of time, latitude and azimuth, and the general principles of the methods of determining longitude. Practical instruction is given in the methods of taking observations.

In geodesy all surveys,, computations and methods of map constructions are based upon the supposition that the earth is a sphere.

Advanced Course (Fourth Year).

The work in this course is intended to fulfil the requirements of the final examinations for Dominion Topographical Surveyors. It is distinguished from the

work of the ordinary course not so much by the subjects as by the degree of refinement to which the investigations are carried.

In geodesy the earth is considered as a spheroid,

Text-Books.

Gillespie—Higher Surveying (*b*), (*c*), (*d*).
Green—Spherical and Practical Astronomy (*e*), (*d*).
Chauvenet—Spherical and Practical Astronomy.
Doolittle—Practical Astronomy.
Gore—Elements of Geodesy (*c*), (*d*).
Helmert—Hohere Geodesie.
Nautical Almanac, 1898 (*c*), (*d*),

Applied Mechanics.

STATICS.

The calculation of the stresses in framed structure, solid and riveted beams, arches, etc. Both graphical and analytical methods used.

THEORY OF THE STRENGTH AND ELASTICITY OF MATERIALS.

THEORY OF COMPOUND STRESS.

DESIGNING OF STRUCTURES in timber, iron and masonry—arches, retaining walls, roofs, bridges, etc.

DYNAMICS.

Representation and measurements of forces and motions.
Principles of work and energy.
Efficiency of machines. Friction.
Transmission of energy—belts, shafts, crank and connecting rod, etc.
Fly-wheels, governors,
Balancing of machinery, etc., etc.

STRENGTH OF THE PARTS OF MACHINES.

MACHINE DESIGN—

HYDRAULICS.

Discharge of water through orifices, notches, etc. Flow in pipes, and open channels. Sewerage, water-works, water-power, water-wheels, turbines, pumps, etc.

THERMODYNAMICS AND THEORY OF THE STEAM ENGINE.

Text-Books and Books of Reference.

Von Ott—Graphic Statics (*a*).
Du Bois—Graphic Statics.
" Strains in Framed Structures.
Greene—Trusses and Arches.
Johnson—Modern Framed Structures (*c*), (*d*).
Merriman and Jacoby—Roofs and Bridges.
Merriman—Mechanics of Materials (*b*), (*c*), (*d*).
Rankine—Applied Mechanics (*c*), (*d*).
Lanza.—Applied Mechanics.
Unwin—Testing of Materials of Construction. (*d*).
Baker—Masonry Construction (*d*).
Patton—Foundations (*d*).
Kidder—Building Construction and Superintendence.
" Architect and Builders' Pocket Book.
Low and Bevis—Machine Drawing and Design (*b*), (*c*).
Low—Machine Drawing (*a*), (*b*), (*c*).
Unwin—Elements of Machine Design (*c*).
Sham—Elementary Treatise on Heat (*c*), (*d*).
Peabody—Thermodynamics (*d*).
" Steam Tables (*d*).
Carpenter—Experimental Engineering (*d*).
Kennedy—Mechanics of Machinery (*b*), (*c*).
Merriman—Hydraulics (*c*), (*d*).
Bodmer—Hydraulic Motors, Turbines, etc., (*d*).
Innes—Centrifugal Pumps, Turbines and Water Motors (*d*).
Gerhard—House Drainage and Sanitary Plumbing (*c*).
Rafter and Baker—Sewage Disposal in the United States.
Santo Crimp—Sewage Disposal Works.
Carpenter—Heating and Ventilation of Buildings (*c*).
Billings—Heating and Ventilation.
Trautwine—Engineer's Pocket Book.
Carnegie—Pocket Companion.

Theory of Mechanism.

Principles of the transmission of motion without reference to force.

Pitch surfaces, spur wheels, bevel wheels, skew-bevel wheels, trains of wheelwork, teeth of wheels, cams, cranks, eccentrics, links, bands and pulleys, hydraulic connections, frictional gearing, link motion for slide valves, etc., etc.

Text-Books and Books of reference.

Rankine—Machinery and Millwork.
Halsey—Slide Valve Gears.
MacCord—Slide Valve and Eccentric.
Goodeve—Elements of Mechanism (*b*).
Kennedy—Mechanics of Machinery (*b*), (*c*).

Electricity.

Instruction is given in this subject by laboratory work in the laboratories both of the School and of the University of Toronto, as well as by courses of lectures partly in the School and partly in the University.

The work comprises—

Elementary Electricity and Magnetism.

Measuring Instruments—

Theory and uses in determining current, electromotive force, resistance of metallic and electrolytic conductors, capacity, magnetic flux, inductance, coefficient of mutual induction, etc., etc.

Mathematical Theory of Electricity.

Applications of Electricity—

Laboratory work and lectures on telegraph, telephone, dynamos, electric lighting; arc and incandescent systems, storage batteries, transmission of power by electricity, etc.

Theory of Alternating Current Generators and Transformers.

Text-Books and Books of Reference.

Thompson, S. P.—Elementary Electricity and Magnetism.
Stewart & Gee—Practical Physics.
Loudon & McLennan—Practical Physics (*b*).
Kempe—Electrical Testing (*b*).
Jackson—Electromagnetism and the Construction of Dynamos (*c*).
Thompson, S. P.—Dynamo Electric Machinery.
Bedell & Crehore—Alternate Currents.
Crehore—Principles of the Transformer (*d*).

Fleming—Alternate Current Transformers, Vol. I. and II. (*d*).
Thompson, S. P.—Polyphase Currents.

Current numbers of the "Electrician." the "Electrical World," and 'La Lumiere Electrique."

Architecture.

History of Architecture—
Egyptian, Assyrian and Persian.
Classic.
Romanesque and Byzantine.
Gothic.
Renaissance.

Orders of Architecture.
History of Ornament.
Principles of Decoration.

Text-Books and Books of References

T. Roger Smith—Classic and Early Christian Architecture (*a*), (*b*).
T. Roger Smith—Gothic and Renaissance (*c*).
Sturgis—European Architecture.
Fletcher—A History of Architecture.
Fergusson—History of Architecture.
Sharpe—Seven Periods of Church Architecture.
Rickman—Gothic Architecture.
Statham—Architecture for General Readers.
Gwilt—Encyclopædia of Architecture.
Vignole—The Five Orders of Architecture (*b*), (*c*).
Leeds—Orders of Architecture (*b*).
Owen Jones—Grammar of Ornament.
Racinet—L'Ornement Polychrome.
Osborne—Art of House Planning (*d*).

Mathematics.

The Pure Mathematics included in this course is taught in the University of Toronto.

The Applied Mathematics is taught partly in the University and partly in the school.

Text-Books and Books of Reference.

Todhunter—Algebra (*a*).
" Spherical Trigonometry (*b*).
Mackay—Elements of Euclid (*a*).
Hall & Knight—Plane Trigonometry (*a*).
C. Smith—Conic Sections (*a*).
Osborne—Calculus.
Loomis—Calculus (*b*).
Newcomb & Holden—Astronomy (*b*).
Ganot—Physics (*b*).
Hamblin Smith—Hydrostatics (*b*).
Balfour Stewart—Heat.
Loudon & McLennan—Practical Physics (*b*).
Tyndall—Sound.

Chemistry.

Courses by the Professor of Applied Chemistry of the School of Practical Science.

Elementary Chemistry.
Applied Chemistry.
The Chemistry of Combustion, Fuels, Furnaces, Artificial Lighting, Explosives, Photography, Building Materials, Water, Air, Sewage, Chemical Manufactures.
Laboratory Work, including Technical Analysis, the Analysis of Food, Water and Air, and Toxicology.

Courses by the Professor of Chemistry of the University of Toronto.

Inorganic Chemistry.
Organic Chemistry.
Chemical Theory.
Physicial Chemistry.

Text-Books and Books of Reference.

Miller & Smale—Qualitative Analysis.
Remsen—Inorganic Chemistry.
Richter—Inorganic Chemistry.
Bloxam & Blount—Chemistry for Engineers and Manufacturers.

Roscoe & Schorlemmer—Treatise on Chemistry.
Miller, W. A.—Elements of Chemistry.
Meyer—Modern Theories of Chemistry.
Ostwald—Lehrbuch der Allgemeinen Chemie.
Ostwald—Outlines of General Chemistry.
Beilstein—Organic Chemistry.
Von Meyer & Jacobson—Lehrbuch der Organischen Chemie.
Thomson—History of Chemistry.
Wagner—Chemical Technology.
Sadtler—Organic Applied Chemistry.
Bloxham—Chemistry.
Fresenius—Qualitative and Quantitative Analysis.
Douglas & Johnson—Qualitative Analysis.
Sutton—Volumetric Analysis.
Jones—Practical Chemistry.
Allen—Commercial Organic Analysis.
Post—Chemische Technische Analyse.
Winkler—Gas Analysis.
Blyth, A. W.—Poisons.
Blyth, A. W.—Foods.
Bolley—Handbuch der Chemischen Technologie.
Watt—Dictionary of Chemistry.
Thorpe—Dictionary of Applied Chemistry.
Meyer—History of Chemistry.
Wurtz—History of Chemical Theory.
Wurtz—Atomic Theory.
Vant't Hoff—Chemistry in Space.
Pattison Muir—Thermo-Chemistry, Elements of.

Mineralogy, Geology, Mining and Metallurgy.

1. Mineralogy and Geology—
   Mineralogy and Crystallography.
   Geology and Palæontology.
   Lithology.
   Physical Geography.
   Blowpipe Analysis.
   Determinative Mineralogy.

2. Mining and Metallurgy—
   Mining Geology.
   Ore Dressing.
   Metallurgy of Iron and Steel.
   Metallurgy of Nickel, Copper, Silver, etc.
   Assaying.
   Milling.

Text-Books and Books of Reference.

Chapman—Mineralogy and Geology of Canada.
Dana—Manual of Geology.
Dana—System of Mineralogy.
Nicholson—Palæontology.
Geikie—Text-Book of Geology.
Plattner—Manual of Blowpipe Analysis.
Chapman or Brush—Mineral Tables.
Ihlseng—Manual of Mining.
Kuhnhardt—Ore Dressing.
Phillips—Ore Deposits.
Balling—Metallhuettenkunde.
Schnabel—Allgemeine Huettenkunde.
Phillips and Bauerman—Elements of Metallurgy.
Mitchell—Assaying by Crookes.
Kemp—Handbook of Rocks.
Kemp—Ore Deposits of the United States.
Harker—Petrography.
Rosenbusch—Petrography.

VACATION WORK.

Thesis and Construction Work.

A subject is given at the end of each session on which the student is required to write a thesis accompanied by drawings and specifications when necessary) during the subsequent vacation.

The engineering and architectural students are also required to make, during the vacation, full and clear notes of various constructions that may fall under their notice.

The value of both the thesis and the construction notes is taken into account in determining standing at the next following examination.

Civil Engineering.

SUBJECT OF THESIS FOR SECOND YEAR.—Roads, Streets and Pavements.
" " THIRD " Sanitary Drainage

Books of Reference.

Gillmore—Roads, Streets and Pavements.
Spalding—Roads and Pavements.
Waring—Sanitary Drainage of Houses and Towns.
Latham—Sanitary Engineering.

Mining Engineering.

SUBJECT OF THESIS FOR SECOND YEAR.—Ore-dressing.
" " THIRD " Mining.

Books of Reference.

Kuhnhardt—Ore-dressing in Europe.
Ihlseng—Manual of Mining.

Mechanical and Electrical Engineering.

SUBJECT OF THESIS FOR SECOND YEAR.—Machine-shop Practice.
" " THIRD " Foundry Practice.

Books of Reference.

Rose—Practical Machinist.
West—American Foundry Practice.
Spretson—Casting and Founding.

Architecture.

For the second year the following set of freehand pencil sketches is required:

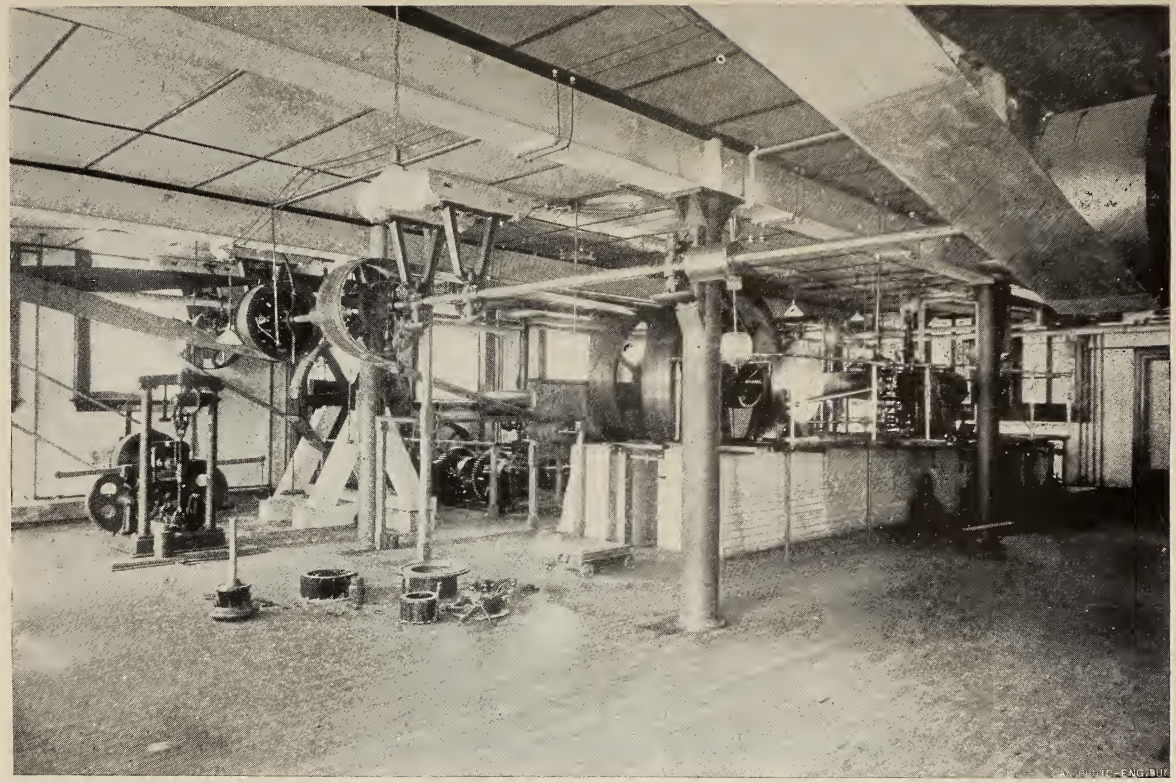
I. Doorway from the object;
II. Staircase "
III. Fireplace, with cross sections;

And seven sheets from the object, prints or drawings, with plans and sections where possible.

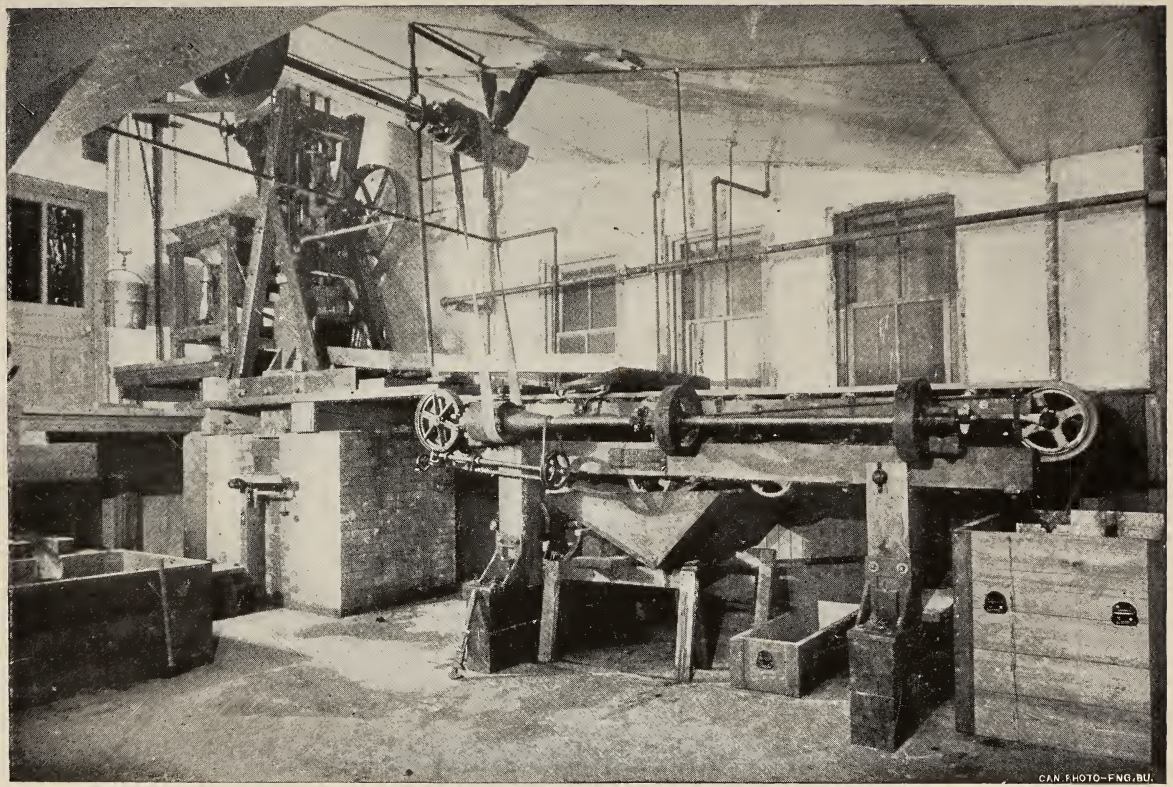
SUBJECT OF THESIS FOR SECOND YEAR.—The above sketches.
" " THIRD " Twelve water-color studies.

Analytical and Applied Chemistry.

SUBJECT OF THESIS FOR SECOND YEAR.—Sulphuric Acid and Alkali Manufacture.
" " THIRD " Coal Tar Products.



EXPERIMENTAL ENGINE.



STAMP MILL.

Books of Reference.

Lunge—Manufacture of Sulphuric Acid and Alkali.
Wagner—Chemical Technology.
Thorpe—Dictionary of Applied Chemistry.

Any other works on the above subjects may be consulted and results of original observations should be given.

Engineering Laboratory.

This Laboratory occupies two floors, having a total area of 10,000 square feet. It consists of three departments, viz :

(*a*) The department for testing materials of construction.

(*b*) The department for investigating the principles governing the application of power. This department is sub-divided into the steam laboratory, the hydraulic laboratory and electrical laboratory.

(*c*) The department for investigating problems connected with standards of length, time, astronomical observations, etc.

In order to prepare specimens for the testing machines, a shop has been fitted up with a number of high-class machine tools specially suited for reducing the specimens to the requisite shapes and dimensions with a minimum of hand labor. It is also supplied with the necessary appliances for making ordinary repairs.

The machines in the department for testing materials are the following :

An Emery 50-ton machine, built by Wm. Sellers & Co., of Philadelphia, for making tests in tension and compression.

A Riehle 100-ton machine for making tests in tension, compression, shearing and cross-breaking. . It will take in posts twelve feet long and beams up to eighteen feet in length.

An Olsen torsion machine for testing the strength and elasticity of shafting. This machine will twist shafts up to sixteen feet in length and two inches in diameter.

A Riehle transverse testing machine of 5,000 pounds capacity. This machine will take specimens up to forty-eight inches in length.

A Riehle 2,000 pounds cement testing machine. The cement testing-room is fitted with all the usual accessories.

The equipment of the power department is as follows :

A Babcock and Wilcox 52-horsepower boiler.

A Harrison-Wharton 12-horsepower boiler.

A 50-horsepower Brown engine. This engine was constructed specially for experimental investigation. It is steam jacketted and has three alternative exhausts, to the open air, to a jet condenser, and to a Wheeler surface condenser, kindly presented to the School by Mr. F. M. Wheeler, of New York, the inventor.

There are also a Blake circulating pump, a Knowles air pump and a Blake feed pump, the latter of which was a gift from the manufacturers.

A machine for testing lubricating oils and measuring journal friction, built by Riehle Bros., of Philadelphia.

The hydraulic division of the laboratory is furnished with a three-throw pump with double acting cylinders. It has a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices and weirs, measuring tanks, etc. A three-feet jet turbine, a nine-inch McCormick, and a six-inch New American turbine, the latter the gift of the firm of William Kennedy & Sons, Owen Sound, form a part of the same equipment.

The power department is equipped with the usual measuring instruments, indicators, guages, guage testing apparatus, scales, brakes, dynomometers.

The shafting is driven by a 7-horsepower Otto gas engine, a 20 kw. Edison motor, and the Brown engine above described.

In the geodetic and astronomical department are a 100-feet and a 66-feet standard of length ; a 10-foot Rogers comparator with a graduating attachment ; a Kater's pendulum ; a Howard astronomical clock and electro-chronograph ; a Troughton & Simms 10-inch theodolite and all the ordinary surveying instruments.

Electrical Laboratory.

The first section of this laboratory is the engineering division, in which a 20-kilowatt motor furnishes power to drive several continuous current dynamos, series, shunt and compound round, tripolar and multipolar, an alternator and the rotary transformer then run as poly phase dynamo. There are direct current motors of 6 H.P and 3 H.P., (Edison and Crocker Wheeler), a rotary converter which may be run as a motor from the continuous current circuit and supply either three phase or two phase alternating currents, a three phase induction motor and smaller motors of which one is for alternating current.

On the walls, besides rheostats, are four types of transformers, Westinghouse, Stanley, Wagner and Thomson-Houston, and meters

or continuous and alternating currents. Arc lamps of eight types, are hung around the laboratories, including the Manhattan incandescent arc lamp, Ward, Universal, Thomson-Houston, Ball, an alternating current arc and the Turbayne, the latter a gift from Mr. W. A. Turbayne.

There are two sets of "Chloride" accumulators available for testing purposes.

A new switchboard has recently been constructed which affords every facility for interconnection of circuits and carries measuring instruments which may be readily introduced into any circuit.

A Thomson balance, multicellular electrostatic voltmeter, and high potential electrostatic voltmeter, a Siemen's electrodynamometer, and standard Weston measuring instruments furnish the means either of accurate observation or for standardizing of instruments for ordinary use. These are generally used in a separate room to which connection is made.

The second section of the electrical laboratory is a room 24 by 49 ft., in another part of the basement, from which iron has as far as possible been removed. Here ten masonry piers support galvanometers, an electrometer, and other mirror reflecting instruments, and testing work can be done free from disturbing influences.

Fume cupboards and sinks have been provided for work with galvanic and storage cells; the room is also supplied with Wheatstone bridges, Kohlrausch apparatus for electrolytes, standard divided microforad condenser, Clark cells, and other apparatus. Wires leading from this room to the switchboard allow measurements to be made here in connection with experiments in the other laboratory.

Connections to the 110-volt circuit of the city are accessible in all the rooms.

The Chemical Laboratories.

The Qualitative Laboratory affords accommodation for about forty students working at one time. The working tables are supplied with water and gas, and there is a fume cupboard within easy reach of each. A complete set of apparatus is supplied to each student on payment of the deposit prescribed.

The Quantitative Laboratories will accommodate about twenty students. They are furnished with convenient work tables and

fume cupboards, and are supplied with the most recent apparatus for gravimetric, volumetric and gasometric analysis, both scientific and technical.

The apparatus includes a number of excellent balances by the best makers, furnaces for fusion, etc, and for organic combustions for experimental vacuum, pan, and filler press.

A very complete set of apparatus for technical gas analysis; all requisites of the assay of ores and furnace products in the wet way; the latest forms of Fischer's and Mahler's apparatus for the determination of the heating power of fuel; facilities for the electrolytic determination of metals, including a Gülcher's thermoelectric pile, spectroscopes, polariscopes, microscopes, and, in short, all the apparatus required for a thorough course in analytical chemistry and assaying.

Blowpipe Laboratory.

This laboratory has Bunsen burners and all necessary accommodation for thirty-six students working at once. All the chemicals and reagents necessary for both qualitative and quantitative blowpipe work are kept here; also a stock of minerals sufficient for a complete course in qualitative blowpipe work, and a number of silver ores in which the silver has been carefully determined for quantitative blowpipe assay. In the balance room adjoining the blowpipe laboratory there is a Jolly balance for determining the specific gravity of minerals.

Assaying Laboratory.

This laboratory is equipped with three gas crucible furnaces, three gas muffle furnaces, two gas roasting furnaces, three charcoal crucible furnaces, and one charcoal cupel furnace, a Taylor hand crusher, Blake laboratory crusher, a muller and all other necessary appliances for pulverizing and preparing ores for fire assay. Adjoining the assay laboratory is a room with a lathe for preparing rock sections or examination under the microscope; also the necessary appliances or making rock sections by hand. Four petrographical microscopes are reserved for the use of advanced students in lithology.

Mill Room.

This room contains a Dodge crusher, a Tulloch ore feeder, a Fraser and Chalmers three-stamp mill with amalgamated silvered copper plates, and a Frue Vanner. The concrete floor of the mill room provides ample space for sampling lots of ore of one or two tons. The machinery is driven by an 8-horse-power Edison motor, which is supplied with current from the city circuit. The mill room is also provided with settling tanks for the tailings and concentrates.

With this plant a complete mill test can be made of a ton or more of ordinary mill ore, thus affording an opportunity to those desiring it, of having a test made under conditions similar to those of actual practice, and upon a larger scale than that of an assay of a few pounds.

The mill room affords the student an excellent opportunity of studying milling, as all the machines in use are of the same construction as those employed in the best large mills.

During the coming summer two other rooms will be fitted up in which will be erected a reverberatory furnace for roasting sulphide and arsenical ores ; leaching vats for treating ores by the cyanide process and a chlorination plant.

This will complete the equipment for treating gold ores, and will make it possible to extract the gold from the concentrates saved by the Frue Vanner.

The furnace will enable students to study the reactions which occur in the roasting of different ores.

Physical Laboratory.

(University of Toronto).

The Physical Laboratory in connection with the University of Toronto is furnished with a large collection of apparatus for lecture experiments in the departments of mechanics, sound, light, heat and electricity. It is also well supplied with instruments of precision for individual work in the same departments. In addition to an elementary laboratory, there are several special laboratories which offer unusual facilities for the conduct of experiments in the various branches of physics.

The electrical apparatus includes electrometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre', Ruhmkorff coils, Crookes' tubes, telephones, etc., etc.

Modern Languages.

No special examinations are held in these languages except in the Fourth Year, but it is expected that every student in a regular course should be able to acquaint himself with the contents of any of the works necessary to his profession, written in these languages. Such books may be prescribed for the terminal examinations.

Library.

The Library is supplied with a number of the more important scientific and technical periodicals. A valuable collection of works of reference on the subjects of study pursued in the School has been formed and is being added to year by year.

Museums.

During the past session thirty cases have been added to the Geological Museum, which includes collections of minerals, rocks and fossils. There is a large general collection of minerals classified in the usual manner, and intended for comparison and reference in advanced classes; but special attention is paid to the extensive collection of Ontario minerals, which, with few exceptions, contains all the species known in the province, and is particularly rich in examples of economic minerals.. The Ontario collection is constantly being added to and is believed to be as complete as any in the Dominion.

Adjoining the mineral collection is a series of ores of all descriptions, particular attention being given to the gold and silver ores of Canada, care being taken to secure typical examples, especially of Ontario gold ores.

The rocks also are arranged in two collections, one a large general collection from foreign localities, containing massive, schistose and sedimentary rocks; the other a set of Canadian rocks, specially

ELEMENTARY PHYSICAL LABORATORY (University of Toronto).

ARCHITECTURAL LECTURE ROOM.

complete in typical country rocks from important ore deposits. An extensive set of thin sections enables advanced students to study both rock collections microscopically.

The paleontological collection consists of fossils and casts, including the chief typical forms needed for determining the age of sedimentary rocks.

A number of wall cases have been prepared for a collection of specimens illustrating industrial chemistry, and a beginning made toward arranging the materials on hand.

In a separate room there is an interesting collection of dressed building and ornamental stones from various parts of Ontario, serving as illustrations in the Architectural Department.

THE ENGINEERING SOCIETY OF THE SCHOOL OF PRACTICAL SCIENCE.

Officers for 1896-7.

President	C. F. KING.
Vice-President	H. S. CARPENTER.
Secretary	H. R. STOVEL.
Treasurer	A. G. PIPER.
Corresponding Secretary	W. F. SCOTT.
Editor	A. T. LAING, B.A. Sc.
Librarian	W. B. HICKS.
Assistant Librarian	T. A. WILKINSON.
Graduates—Representative	J. A. BAIN.
Fourth Year do	H. V. HAIGHT.
Third Year do	M. B. WEEKES.
Second Year do	J. H. SHAW.
First Year do	E. G. YEATES.

The Society meets every second Wednesday during the Academic Year. Papers are read and discussions are held on engineering subjects. The Society subscribes for the leading engineering journals for the use of the students, and publishes a pamphlet annually, containing the best papers read before the Society.

SESSION 1896-7.

STUDENTS IN ATTENDANCE.

FIRST YEAR.

Regular Students.

1. Allan, G. L.
3. Baker, F. E.
3. Barley, J. H.
1. Bowes, J. L.
3. Burns, T. L.
3. Chubbuck, L. B.
2. Clothier, G. A.
1. Cooper, C.
2. Coulthard, R. W.
3. Craig, J. A
2. Elliott, J. C.
3. Foreman, W. E.
3. Green, W. S.
3. Gregory, H. G.
3 Guy, E.
3. Henderson, S. E. M.
3. Hunt, G. A.
1. Latham, R.
2. McArthur, P. C.
3. Monds, W.
1. Patterson, J.
3. Price, H. W.
2. Revell, G. E.
3. Saunders, G. A.
1. Shanks, T.
1. Tennant, D. C.
3. Tye, C. H.
3. VanEvery, W. W.
3. Yeates, E. G.

Non-Regular Students Taking Full Courses.

3. Armstrong, H. J.
2. Burnside, T.
3. Clarke, N.
3. Clendeneng, W. G.
1. Cooper, C. E
2. Davidson, J. L.
1. Finch, H. J. W.
3. Hall, G. A.
3. Hare, W. A.
3. Harris, B. S.
3. Hemphill, W.
3. Henry, D. E.
2. Holcroft, H. S.
1. Hore, H. W.
4. Hoy, J. A.
3. Hunt, C. R.
3. Jordan, J.
2. McArthur, R. E.
3. Morrison, W. H.
2. Neelands, E. V.
1. Newman, J. J.
3. Piper, A. G.
3. Pope, A. S. H.
3. Potts, M. C.
1. Power, G. H.
3. Rounthwaite, C. H. E.
3. Smith, A. H.
3. Stephens, F.
3. Wagner, W. E.
2. Watt, G. H.
3. White, E. H.

SECOND YEAR.

3. Berwick, J. R.
2. Boyd, W. H.
1. Bray, L. T.
2. Carter, W. E.
3. Collins, C. D.
3. Darling, E. H.
3. Gordon, C. B.
1. Grant, W. F.
1. Gzowski, C S.
5. Kennedy, W. A.
1. Kormann, J. S.
3. Lavrock, G. E.
2. Lea, E. P.
3. Little, F.
4. Mackintosh, D.
3. McMichael, C.
1. McNaughton, F. D.
1. Perry, F. N.
1. Shaw, J. H.
3. Shipley, A. E.
3. Smallpiece, F. C.
1. Smith, R.
1. Stovel, H. R.
3. Wilkinson, T. A.
3. Williamson, D. A.
1. Willson, R. D.

THIRD YEAR.

3. Alexander, F. H.
2. Andrewes, E.
2. Bow, J. A.
1. Carpenter, H. S.
5. Charlton, H. W.
4. Forward, E. A.
3. Gray, A. T.
3. Hicks, W. A. B.
4. King, C. F.
3. Morrison, H.
1. Proudfoot, H. W.
2. Robinson, A. H.
4. Scott, W. F.
3. Smillie, R.
3. Stacey, G. E.
2. Stull, W. W.
1. Weekes, M. B.
1. Weldon, E. A.

FOURTH YEAR.

Angus, R. W.
Bain, J. W.
Burwash, L. T.
Elliott, H. P.
Haight, H. V.
Harkness, A. H.
Laird, R.
Macbeth, C.
Martin, T.
Richardson, G. H.

Students Taking Partial Courses.

Anderson, H. W.
Beatty, F. R.
Bertram, R. M.
Boyd, V.
Chaplin, G. W.
Cotterill, J.
Gordon, Dr. E. P.
Hislop, J.
Laughlin, A.
Macallum, A. F.
McIntyre, E. J., B. A.
Mackay, J. W.
Macmillan, A. N.
McGraw, A.
Roper, W. P.
Rosebrugh, R. M.
Ross, A. B.
Sanderson, A.
Templeman, G. E.
Troup, W. J.
Webster, E. B.

Prospectors' Class.

Arnott, D.
Bayly, G. J.
Belton, J. C.
Botham, T. H.
Bradbury, G. H.
Brown, C. P.
Broughall, G.
Burgess, A. E.
Carter, S. R.
Clark, C. H.
Conlon, J. J.
Conlon, W.
Creighton, J.
Douglas, A.
Duncan-Clark, S. C.
Duncan-Clark, H. B.
Esson, W. A.
Eyre, P. H.
Govenlock, W.
Hamilton, W. B.
Hamilton, H. R.
Heard, J.
Howe, S. L.
Houston, H. C.
Irvine, J.
Irwin, J.
Lehmann, W.
Leys, W. A.
Longstreet, G. C.
McLennan, R.
McMaster, H.
Moore, W. B.
Murphy, E.
O'Hara, D.
Ross, H. W.
Ryan, D. J.
Scott, A.
Warren, J.
Whitehead, A. B.
Wickson, F. R.

PRIZEMEN.

Engineering.

1879.—	I.	Year	J. McAree	1st prize.
1880.—	II.	Year	J. L. Morris	1st prize.
1881.—	I.	Year	G. H. Duggan	1st prize.
	II.	Year	D. Jeffrey	1st prize.
1882.—	I.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	II.	Year	G. H. Duggan	1st prize.
	III.	Year	D. Jeffrey	1st prize.
1883.—	I.	Year	B. A. Ludgate	1st prize.
	"	"	A. M. Bowman	2nd prize.
	II.	Year	A. R. Raymer	1st prize.
	"	"	E. W. Stern	2nd prize.
	III.	Year	G. H. Duggan	1st prize.

1884.—	II.	Year	B. A. LUDGATE ..... 1st prize.
	III.	Year	E. W. STERN ..... 1st prize.
	"	"	A. R. RAYMER ..... 2nd prize.
1885.—	I.	Year	A. F. LOTT ..... 1st prize.
	"	"	J. ROGER ..... 2nd prize.
	II.	Year	T. K. THOMSON ..... 1st prize.
	III.	Rear	B. A. LUDGATE ..... 1st prize.
1886.—	I.	Year	C. H. C. WRIGHT ..... 1st prize.
	"	"	J. E. ROSS ..... 2nd prize.
	II.	Year	A. E. LOTT ..... 1st prize.
1887.—	I.	Year	H. E. T. HAULTAIN ..... 1st prize.
	II.	Year	C. H. C. WRIGHT ..... 1st prize.
	III.	Year	A. E. LOTT ..... 1st prize.
	"	"	J. ROGER ..... 2nd prize.
1888.—	I.	Year	E. B. MERRILL ..... 1st prize.
	"	"	F. M. BOWMAN ..... 2nd prize.
	II.	Year	D. D. JAMES ..... 1st prize.
	III.	Year	C. H. C. WRIGHT ..... 1st prize.
1889.—	I.	Year	J. K. ROBINSON ..... 1st prize.
	"	"	G. E. SILVESTER ..... 2nd prize.
	II.	Year	E. B. MERRILL ..... 1st prize.
	"	"	F. M. BOWMAN ..... 2nd prize.
	III.	Year	D. D. JAMES ..... 1st prize.
1890.—	I.	Year	C. FAIRCHILD ..... 1st prize.
	II.	Year	J. K. ROBINSON ..... 1st prize.
	III.	Year	F. M. BOWMAN ..... 1st prize.
	"	"	E. B. MERRILL ..... 2nd prize.
1891.—	I.	Year	A. J. MCPHERSON ..... 1st prize.
	"	"	R. B. WATSON ..... 2nd prize.
	II.	Year	J. B. GOODWIN ..... 1st prize.
	III.	Year	G. E. SILVESTER ..... 1st prize.
	"	"	[illegible] W. DILL ..... 2nd prize.

1892.— I. Year.....A. E. Bergey..... 1st prize.
" " .....R. W. Angus .....2nd prize.
II. Year.....A. J. McPherson ..... 1st prize.
" " .....R. B. Watson .....2nd prize.
III. Year.....E. J. Laschinger ..... 1st prize.
" " .....C. Fairchild .....2nd prize.

The grant for prizes was withdrawn at the close of 1892.

Architecture.

The prize in Architecture is the gift of Mr. D. B. Dick, Architect, Toronto.

1891.— I. Year .....H. Ballantyne.

1892.— I. Year.....J. A. Ewart.

1893.— I. Year.....A. Harkness.

1894.— I. Year.....E. A. Forward.

1895.— I. Year.....W. F. Scott.

1896.— I. Year.....D. Mackintosh.

GRADUATES.

NOTE.—Graduates are requested to inform the Secretary of changes in their addresses.

YEAR.	—	NAME.	ADDRESS.
1892..	1	Alison, T. H., B.A.Sc., Draftsman.....	Post & McCord, 289 4th Ave., New York.
1892..	1	Allan, J. R., O.L.S	Renfrew, Ont.
1892..	1	Anderson, A. G	Port Dover, Ont.
1894..	3	Angus, R. W., School of Practical Science (Post-graduate course)	Toronto, Ont.
1888..	1	Apsey, J. F., O.L.S., Resident Engineer Baltimore Belt R.R.....	2125 N. Congress St., Baltimore, Md.
1893..	1	Ardagh, J. A., Town Engineer.....	Barrie, Ont.
1895..	1	Armstrong, J., B.A.Sc, Assistant	T. R. Deacon, O.L.S., Rat Portage, Ont.
1888..	1	Ashbridge, W. T	City Engineer's Office, London, Ont.
1896..	2	Bain, J. W., School of Practical Science (Post-graduate year)	Toronto, Ont.
1888..	1	Ball, E. F., A.M. Can. Soc. C.E. Surveyor and Consulting Engineer.....	Rockvale, Colo.
1893..	4	Ballantyne, H. F., B.A.Sc.....	Post & McCord, New York.
1894..	1	Barker, H. F	Orillia, Ont.
1891..	1	Beatty, H. J., O.L.S.....	Pembroke, Ont.
1894..	3	Beauregard, A. T., B.A.Sc	New England Engineering Company, Waterbury, Mass.
1894..	1	Bergey, A. E	Mannheim, Ont.
1895..	3	Blackwood, A. E., Fellow in Electrical Engineering, School of Practical Science..	Toronto, Ont.
1885..	1	Bleakley, F. W	Room 46, Sullivan Block, Seattle, W. T.
1895..	1	Boswell, E. J., O.L.S	Rat Portage.
1890..	5	Boustead, W. E., B.A.Sc., Acting Demonstrator in Mineralogy, School of Practical Science	Toronto, Ont.
1886..	1	Bowman, A. M., D. & O.L.S., Assistant Engineer, Ohio River Improvement....	Merill, Pa.
1890..	1	Bowman, F. M., C.E., O.L.S., Chief Engineer	Riter & Conley, Allegheny, Pa.
1885..	1	Bowman, H. J., D. & O.L.S., A.M. Can. Soc. C.E., Town Engineer	Berlin, Ont.
1894..	3	Boyd, D. G., Draftsman.....	Crown Lands Department, Toronto, Ont.
1895..	3	Brebner, G., Draftsman	McKee & Marwick, Petrolia, Ont.
1895..	3	Brodie, W. M., B.A.Sc., Draftsman.....	Pendrith & Co., Toronto, Ont.

GRADUATES.—*Continued.*

YEAR	—	NAME.	ADDRESS.
1838..	1	Brown, D. B., O.L.S., Mexican Southern R	Old Mexico.
1893..	1	Brown, G. L., Town Engineer	Morrisburg, Ont.
1895.	3	Brown, L. L., Locomotive Dept., N.Y., N. H. & H. Ry	New Haven, Conn.
1890..	1	Bucke, M. A	Slocan Star Mines, Sandon, B C.
1894..	3	Bucke, W.A., B.A. Sc	Royal Electric Co., Montreal. P.Q.
1883..	1	Burns, D., O.L.S., A.M. Can. Soc. C. E.	Keystone Bridge Co., Pittsburgh, Pa.
1887..	1	Burns, J. C., deceased	.....
1896..	2	Burwash, L. T., School of Practical Science (Post-graduate course)	Toronto, Ont.
1896..	3	Campbell, G.M	Can. Pacific Railway, Montreal.
1895..	4	Campbell, R. G	St. Catharines. Ont.
1888..	1	Canniff, C. M	City Surveyor's Office, Toronto, Ont.
1889..	1	Carey, B	Engineer's Office, Toronto.
1894..	1	Chambers, J., O.L.S	Rat Portage, Ont.
1889..	1	Chalmers. W. J	Cayuga, Ont.
1893..	1	Charlesworth, L. C., O L.S	Stewart & Charlesworth, Collingwood and Rat Portage.
1888..	1	Chewett. H. J., B.A. Sc., A.M. Can. Soc. C E., Civil and Mining Engineer	83½ York St., Toronto.
1889..	1	Clement, W. A	City Engineer's Office, Toronto, Ont.
1895..	3	Connor, A W., B.A	Central Bridge Works, Peterboro', Ont.
1890..	1	Corrigan, G.D., deceased	.....
1891..	1	Deacon, T.R., O.L.S., Town Engineer	Rat Portage, Ont.
1896..	2	De Cew, J. A	Ainslie, Washington, U. S.
1891..	1	Dill, C. W., Superintendent	Clifton, Suspension Bridge, Niagara Falls, N. Y.
1895..	1	Dobie. J. S , B. A. Sc., Mining Engineer.	Port Arthur.
1890..	1	Duff, J. A., B.A., A. M. Can. Soc. C.E., L cturer in Applied Mechanics, School of Practical Science	Toronto, Ont.
1883..	1	Duggan, G. H., M. Can. Soc. C.E., Chief Engineer, Dominion Bridge Co	Montreal, P. Q.
1893..	1	Dunn, T. H	Arkona, Ont.
1896..	3	Elliott, H.P., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1890..	1	English, A.B	106 Gould St., Toronto.
1894..	4	Ewart, J.A., B.A. Sc., Architect	Arnoldi & Ewart, Architects, Ottawa, Ont.

GRADUATES.—*Continued.*

YEAR.	—	NAME.	ADDRESS.
1893..	1	Fairbairn, J. M. R	Peterborough, Ont.
1892..	1	Fairchild, C., O.L.S	Simcoe, Ont.
1893..	4	Fingland, W., Architect	307 W. 119th St., New York.
1893..	1	Forester, C	Gormley. Ont.
1893..	1	Francis, W. J., Assoc. M. Can. Soc. C.E., Chief Draftsman	Central Bridge Works, Peterboro' Ont.
1890.	1	Garland, N. L	Eglington, Ont
1888..	1	Gibbons, J., D. & O.L.S	Alaska Boundary Survey, Department of the Interior, Ottawa, Ont.
1893..	3	Goldie, A.R., Assistant Manager	Goldie & McCulloch Co., Ltd, Galt, Ont.
1892..	1	Goodwin, J. B., B.A.Sc.	Town Engineer's Office, Niagara Falls, Ont.
1895..	1	Guernsey, F. W., Engineer	Neepawa Gold Mining Co., Wabigoon.
1896..	3	Gurney, W. C	Toronto, Ont.
1896..	3	Haight, H. V., School of Practical Science (Post-graduate course)	Toronto, Ont.
1893..	3	Hanly, S. C	A. R. Williams, Machinery Co., Ltd., Toronto.
1889..	1	Hanning, G. F	Toronto Railway Co., Toronto, Ont.
1895..	4	Harkness, A. H., School of Practical Science (Post-graduate course)	Toronto, Ont.
1889..	1	Haultain, H. E. T., Mining Engineer	Barberton, South Africa,
1885..	1	Henderson, E. E, O.L.S	Henderson P.O., Piscatiquois, Me.
1894..	3	Herald, W. J., B.A. Sc., Mechanical Engineer	Noble Three Mining Co, Rossland, B.C.
1886..	1	Herman, E. B., D. & O.L.S	Gordon, Hermon & Burwell, Vancouver, B.C.
1895.	3	Hull, H. S., B.A. Sc., Draftsman	Stilwell-Bierce & Smith Vale Pump Co., Dayton, O.
1890..	1	Hutcheon, J., O.L.S., City Engineer	Guelph, Ont.
1890 .	1	Innes, W. L., O.L.S., C.E	Ranney & Innes, Civil Engineers and Surveyors, Peterboro', Ont.
1889..	1	Irvine, J	Harriston, Ont.
1889 .	1	James, D. D., B.A, B.A. Sc	Rat Portage, Ont.
1891..	5	James, O. S., B.A. Sc	19½ Victoria street, Toronto.
1882 .	1	Jeffrey, D	Contractor, Stratford, Ont.

GRADUATES —*Continued.*

YEAR.	—	NAME.	ADDRESS.
1894..	3	Job, H E, B.A. Sc, Manager	Kay Electric Co., Hamilton, Ont.
1894..	1	Johnson, S. M., B.A. Sc, O.L.S., Assistant Engineer	Trail Creek Tramway Co., Rossland, B.C.
1894..	3	Johnston, A. C. B.A. Sc., Draftsman	McMyler & Co., Cleveland, O.
1894..	1	Jones, J. E., Draftsman	Carnegie Steel Co., Pittsburg, Pa.
1893..	4	Keele, J., B.A. Sc, Fellow in Civil Engineering, School of Practical Science	Toronto, Ont.
1882..	1	Kennedy, J. H, C.E., O.L.S., Architect, etc	St. Thomas, Ont.
1884..	1	Kirkland, W. C	Illinois Central Ry., New Orleans, La.
1893..	1	Laidlaw, J. T., B.A. Sc., Consulting Mining Engineer	Rossland, B.C.
1892 .	1	Laing, A. T. B.A. Sc., Fellow in Surveying, School of Practical Science	Toronto, Ont.
1896..	1	Laing, W. F	T. H. Wiggins, Cornwall, Ont.
1886..	1	Laird, R., O.L.S	Reduction Works, Rat Portage.
1891..	1	Lane, A. O.L.S., Chief Draftsman	Structural Department Maryland Steel Co., Sparrows' Point, Md.
1892..	4	Langley, C. E., Architect	Langley & Langley, Architects, Toronto.
1892..	1	Laschinger, E. J, B.A. Sc, Chief Draftsman	Consolidated Gold Fields of South Africa, Johannesburg, South African Republic.
1893..	3	Lash, F. L., Chief Engineer	Sugar Factory, Boedoeran, Java.
1894..	3	Lash, N. M	Bell Telephone Co., Toronto, Ont.
1896..	3	Lawrie, R. R	Bowmanville, Ont.
1892..	5	Lawson, W, B.A. Sc., Acting Demonstrator in Chemistry School of Practical Science	Toronto, Ont.
1892..	3	Lea, W. A. B.A. Sc	5 Bedford Rd., Toronto, Ont.
1887..	1	Lott, A. E., Railway Construction	San Antonio de la Huerta, Mexico.
1885 .	1	Ludgate, B.A., O.L.S	Denison, Texas.
1893 .	1	McAllister, A. L, B.A. Sc., Draftsman	New Jersey Steel and Iron Co., Trenton, N. J.
1891..	1	McAllister, J. E., B.A. Sc	Penn Bridge Co., Beaver Falls, P.A.

GRADUATES.—*Continued.*

YEAR	—	NAME.	ADDRESS.
1893..	1	Macallum, A. F.....	Technical School Toronto, Ont.
1882..	1	McAree, J. B.A. Sc., D.T.S., O.L.S.. Mining Engineer and Surveyor.....	Dominion Gold Mining and Reduction Co., Ltd., Rat Portage, Ont.
1896..	3	Macbeth, C., School of Practical Science, (Post-graduate course).....	Toronto, Ont.
1887..	1	McCullough, A.L., O.L.S., A.M. Can. Soc. C.E.....	Civil and Hydraulic Eng., Petrolea, Ont.
1888..	1	McDowall, R., O.L.S., A.M., Can. Soc. C.E., Town Engineer.....	Owen Sound, Ont.
1884..	1	McDougall, J., B.A., County Engineer..	Court House, Toronto.
1892..	1	McEntee, B., B.A. Sc., Assistant	J. McArce, Rat Portage, Ont.
1888..	1	McFarlane, G. W., O.L.S., Assistant County Engineer.....	Court House, Toronto.
1893..	1	McFarlen, T. J.....	.....
1895..	3	McGowan, J., B.A., B.A. Sc., Draftsman.	Pittsburg Bridge Co., Pittsburg, Pa.
1885..	1	McKay, O., O.L.S., Railway Engineer..	Windsor, Ont.
1895..	3	McKay, W. N.....	100 Madison ave., Toronto, Ont.
1895..	3	McKinnon, H. L., B.A. Sc	Hughes Steam Pump Co., Cleveland, O.
1896..	3	MacMurchy, J. A.....	Hillsburgh, Ont.
1893..	1	McPherson, A.J., B.A. Sc, O.L.S., Town Engineer.....	Galt, Ont.
1891..	1	McTaggart, A.L., B.A. Sc.....	Fhoem Pressed Steel Co., Alleghany, Pa.
1893..	1	Main, W. T.....	Brampton, Ont.
1888..	1	Marani, C. J., General Agent	Canada Permanent Loan Co., Vancouver, B. C.
1893..	1	Marani, V. G., Assistant Engineer.....	Cleveland Gas, Light & Coke Co, 356 Superior St., Cleveland, O.
1887..	1	Martin, F., O.L.S., M.D	Hospital for Sick Children, Toronto, Ont.
1896..	1	Martin, T., School of Practical Science, (Post-graduate course)	Toronto, Ont.
1895..	1	Meadows, W. W	Rat Portage.
1890	1 & 3	Merrill, E.B., B.A., B.A. Sc.....	Siemens Bros. & Co., Woolwich, Eng.
1888..	1	Mickle, G. R., B.A., Mining Engineer, Lecturer in Mining, School of Practical Science	Toronto, Ont.

GRADUATES.—*Continued.*

YEAR	—	YEAR.	ADDRESS.
1889..	1	Mill, F. X	268 Main St. E., Pittsburg, Pa.
1892..	3	Milne, C. G., B.A. Sc	Hamilton Bridge Co., Hamilton, Ont.
1893..	1	Mines, W., B.A. Sc., Consulting Engineer	Corning, N. Y.
1894..	3	Minty, W., B.A. Sc., Fellow in Mechanical Engineering, School of Practical Science	Toronto, Ont.
1892..	1	Mitchell, C.H., B.A. Sc., Town Engineer.	Niagara Falls, Ont.
1889..	1	Moberly, H. K., Asst. Mechanical Engineer	Youghiogheny River Coal Co., Scott Haven, Pa.
1891..	1	Moore, J. E. A, C. E., Draftsman	Riter and Conley, Allegheny, Pa.
1888..	1	Moore, J. H., O.L.S., Town Engineer	Smith's Falls, Ont.
1881..	1	Morris, J. L., C.E., O.L.S	Pembroke, Ont.
1891..	1	Newman, W., O.L.S., City Engineer	J. W. Tyrrell, C. E., Windsor, Ont.
1894..	3	Nicholson, C. J	Hamilton.
1890..	1	Pedder, J. R., O.L.S., deceased	
1887..	1	Pinhey, C. H., D. & O.L.S	Soulanges Canal, Coteau Landing, P.Q.
1892 .	1	Playfair, N. L	131 Isabella Street, Toronto.
1892..	1	Prentice, J. M., deceased	
1884..	1	Raymer, A. R, Asst. Engineer, Pennsylvania, R. R	
1888..	1	Richardson, G.H., Divisional Engineer, C. P. R	Revelstoke, B.C.
1884..	1	Robertson, J., O.L.S	Coad & Robertson, Civil Engineers, O.L. Surveyors, etc., Glencoe.
1893..	3	Robertson, J. M	62 Admiral Rd., Toronto.
1895..	1	Robinson, F. J	Rat Portage.
1891..	1	Robinson, J. K., deceased	
1887..	1	Roger, J., O.L.S	Mitchell, Ont.
1894..	1	Rolph, H	Pacific Rolling Mills, San Fransisco, Cal.
1888..	1	Rose, K	Mexican Southern Ry., Mexico.
1889..	1	Rosebrugh, T. R., M.A., Lecturer in Electrical Engineering, School of Practical Science	Toronto, Ont.
1892..	1	Ross, J. A., Chief Draftsman L.S. & M.S. Ry	Toledo, O.
1888..	1	Ross, J. E., O.L.S	Riverside, Cal.
1890..	3	Ross, R.A., E.E., Consulting Engineer	Montreal, P.Q.
1893..	1	Russel, R., Engineer's Staff, O. A. & P. S. Ry	Pembroke, Ont.

GRADUATES.—*Concluded.*

YEAR.	—	NAME.	ADDRESS.
1891..	1	Russel, W., Engineer	O. A. & P. S. Ry., Pembroke, Ont.
1894..	1	Shields, J. D., B.A. Sc	Rat Portage, Ont.
1896..	3	Shipe, R. R	Shipe Wood Rim Co., 66 Esplanade W., Toronto, Ont.
1891..	1	Silvester, G. E., O.L.S	Sudbury, Ont.
1892..	1	Smith, A., Engineer	Lucy Furnaces, Pittsburg, Pa.
1894..	1	Smith, Angus O.L.S	Scane & Smith, Engineers and Surveyors, Ridgetown, Ont.
1883..	1	Speller, F. N., B.A. Sc., Assistant Chemist	Carnegie Steel Co., Homestead, Pa.
1894..	3	Spotton, A. K	Waterous Engine W'rks, Brantford, Ont
1893..	1	Squire, R. H., O.L.S	City Engineer's Office, Brantford, Ont.
1884..	1	Stern, E. W	Koken Iron Works, St. Louis, Mo.
1895.	3	Stocking, F. T	689 Prospect Avenue, Buffalo, N Y.
1891..	1	Symmes, H. D	Engineer Street Ry., St. Catharines, Ont.
1893..	1	Taylor, W. V., O.L.S	Bay of Quinte Ry. and Navigation Co, Gananoque, Ont.
1892..	1	Thomson. R. W, B.A.Sc	Consolidated Gold Fields of South Africa, Johannesburg, South African Republic.
1886 .	1	Thomson, T. K, C.E., A.M. Can. Soc. C.E., Consulting Engineer	277 Pearl street, N.Y.
1895 .	3	Tremaine, R. C. C, B.A.Sc	Toronto, Ont.
1885..	1	Tyrrell, H. G., C.E. A.M. Can. Soc. C.E.	Berlin Iron Bridge Co., East Berlin, Conn.
1883..	1	Tyrrell, J. W., C.E., D. & O.L.S	42 James street N., Hamilton, Ont.
1893..	1	Watson, R. B., Chief Draftsman	Riter & Conley, Allegheny, Pa.
1892..	3	White, A. V., Superintendent	Hyslop, Son & McBurney Bicycle Works, Toronto, Ont.
1889..	1	Wickett, T., M.D	.....
1890..	1	Wiggins, T. H., O.L.S., Town Engineer	Cornwall, Ont.
1890..	1	Withrow, W. J.. Manager	Featherstonhaugh & Co., Montreal, P.Q.
1888 .	1	Wright, C. H C., B.A. Sc., Lecturer in Architecture, School of Practical Science	524 Bathurst street, Toronto, Ont.
1894 .	3	Wright, R. T	Boston Street Railway Co., 32 E. Brooklyn St., Boston, Mass.

University of Toronto.

Degree B. A. Sc.

Date of Admission.	
1893	Alison, T. H.
1896	Armstrong, J.
1894	Ballantyne, H. F.
1895	Beauregard, A. T.
1896	Brodie, W. M.
1895	Bucke, W. A.
1894	Chewett, H. J.
1896	Dobie, J. S.
1895	Ewart, J. A.
1894	Goodwin, J. B.
1895	Herald, W. J.
1896	Hull, H. S.
1894	James, D. D.
1893	James, O. S.
1895	Job, H. E.
1895	Johnson, S. M.
1895	Johnston, A. C.
1894	Keele, J.
1894	Laidlaw, J. T.
1893	Laing, A. T.
1893	Laschinger, E. J.
1893	Lawson, W.
1893	Lea, W. A.
1894	McAllister, A. L.
1895	McAllister, J. E.
1893	McAree, J.
1893	McEntee, B.
1896	McGowan, J.
1896	McKinnon, H. L.
1894	McPherson, A. J.
1895	McTaggart, A. L.
1894	Merrill, E. B.
1893	Milne, C. J.
1896	Mines, W. H.
1895	Minty, W.
1894	Mitchell, C. H.
1895	Shields, J. D.

Degree of B. A. Sc.—*Continued.*

Date of Admission.	
1894	Speller, F. N.
1894	Squire, R. H.
1893	Thomson, R. W.
1896	Tremaine, R C. C.
1893	Wright, C. H C.

Degree of C. E.

Date of Admission.	
1895	Bowman, A. M.
1893	Bowman, F. M.
1892	Chewett, H. J.
1893	Imes, W. L.
1886	Kennedy, J. H.
1895	McAllister, J. E.
1896	Moore, J. E. A.
1885	Morris, J. L.
1892	Thomson, T. K.
1894	Tyrrell, H. J.
1889	Tyrrell, J. W.

Degree of E. E.

1896	Ross, R. A.